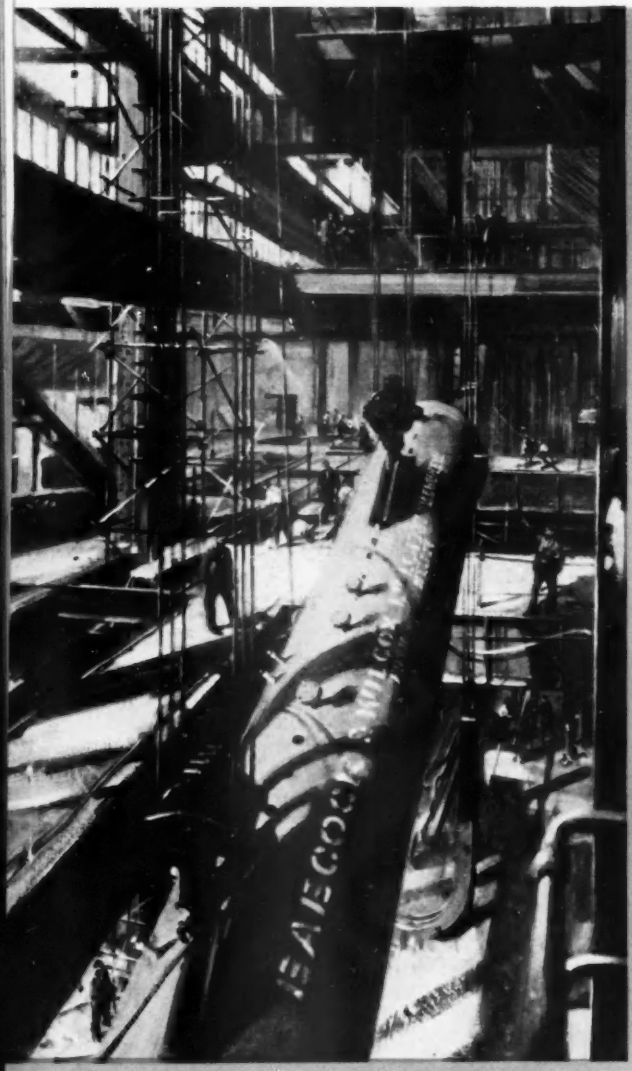
ELECTRICAL TIMES

THURSDAY
30 JULY
1953
NINEPENCE



BABCOCK

THE DRUM LIFT

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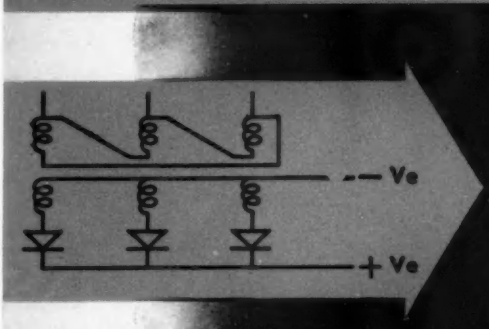
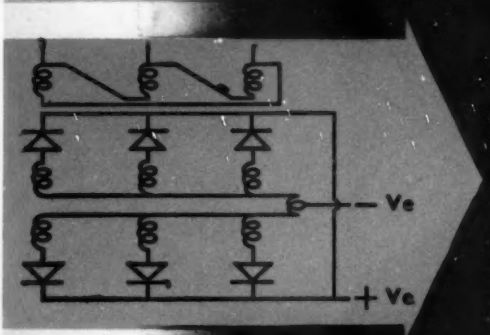


NORMAL
PLATING RECTIFIER
OUTPUT 8 VOLTS 1000 AMPS
RIPPLE 18%
INPUT 400 VOLTS 3 PHASE
17·9 AMPS



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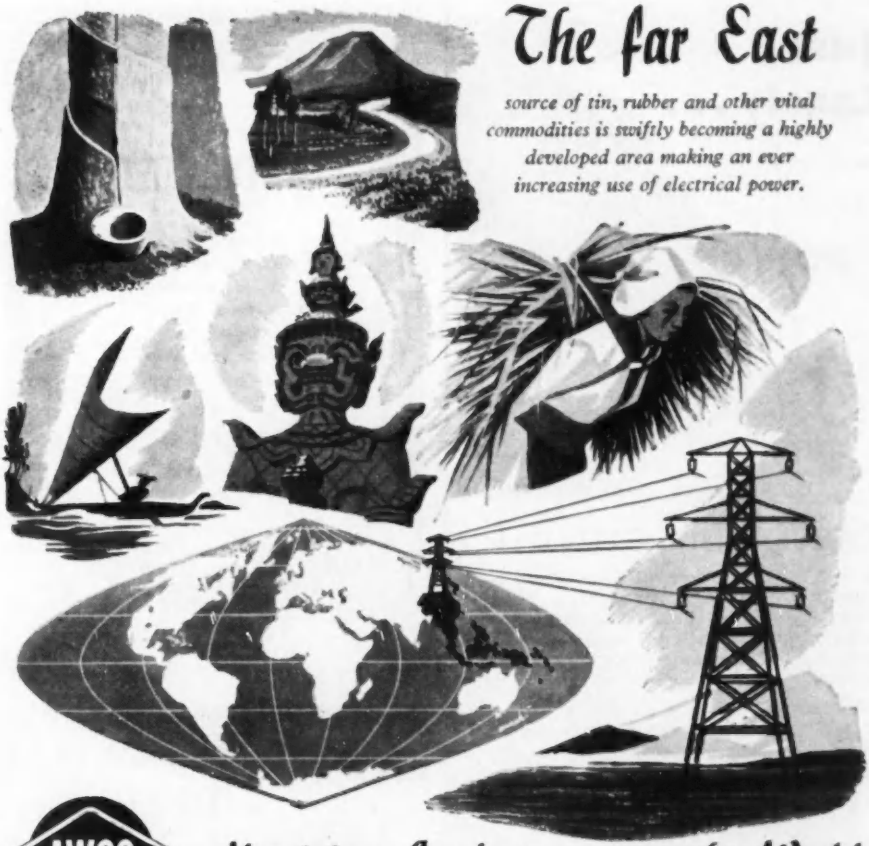

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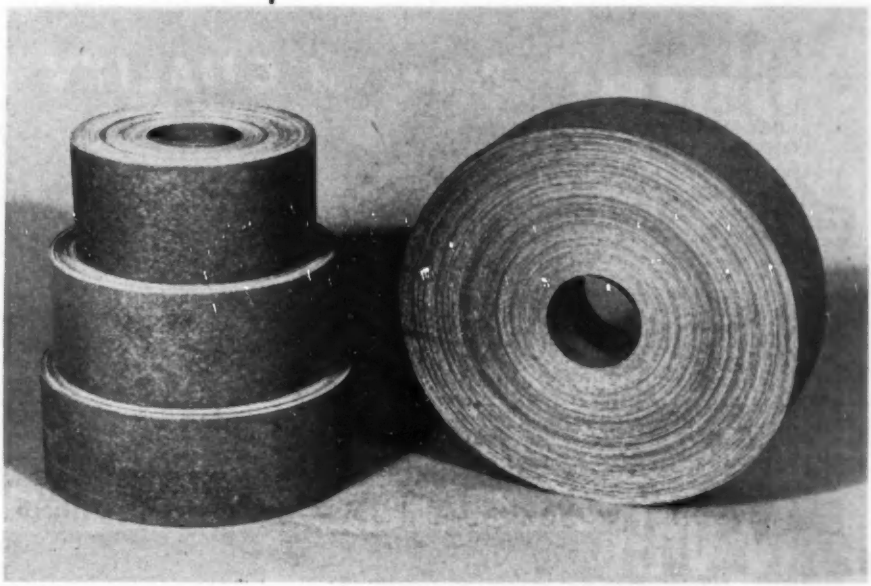

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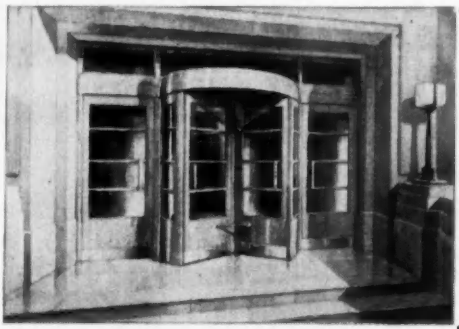

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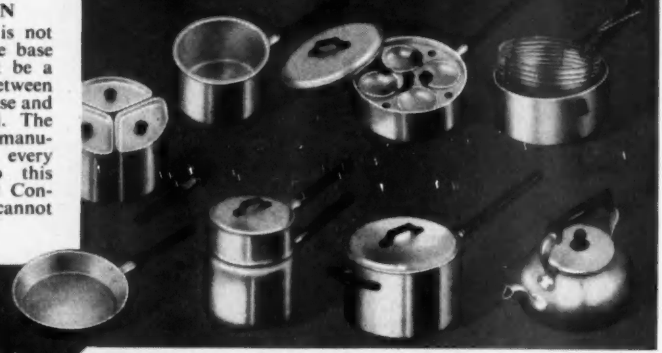

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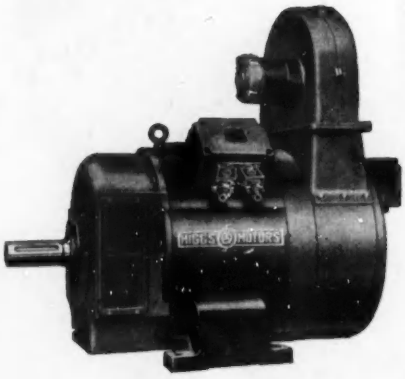

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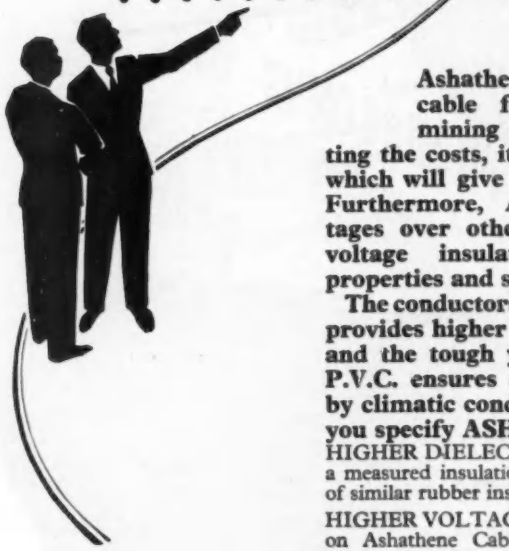

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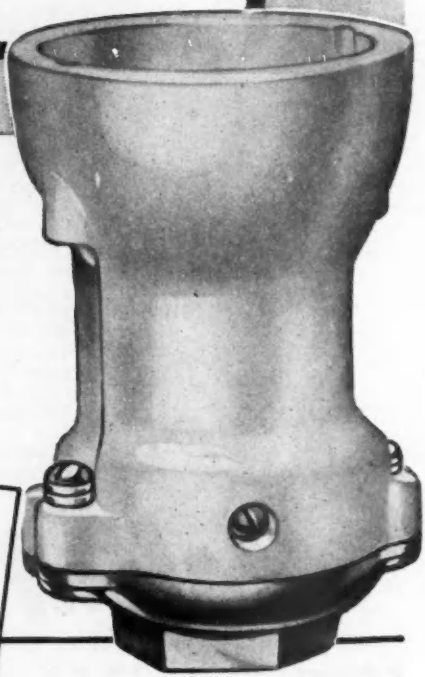
But he that filches from me my good name
Robs me of that which not enriches him,
And makes me poor indeed."

William Shakespeare



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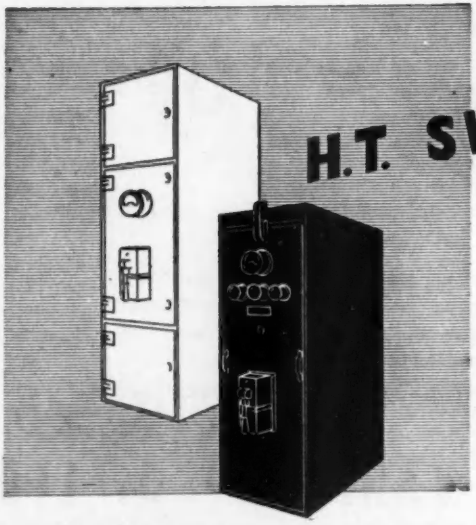

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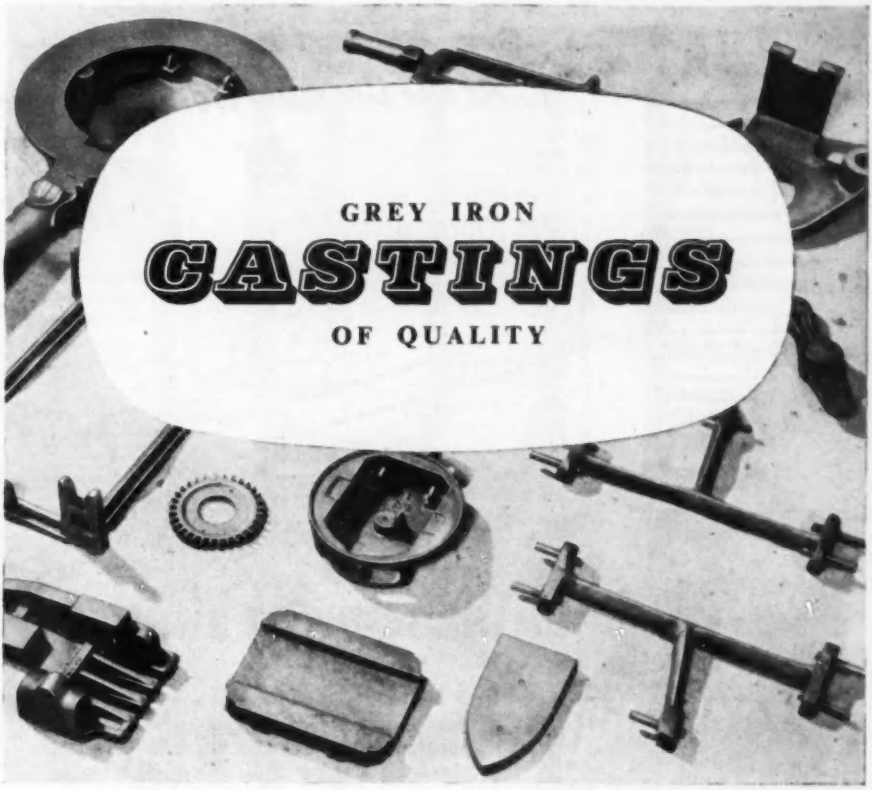

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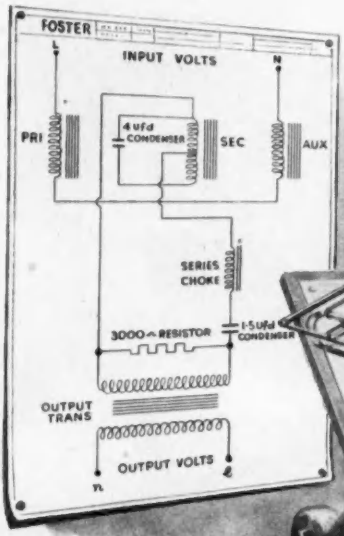
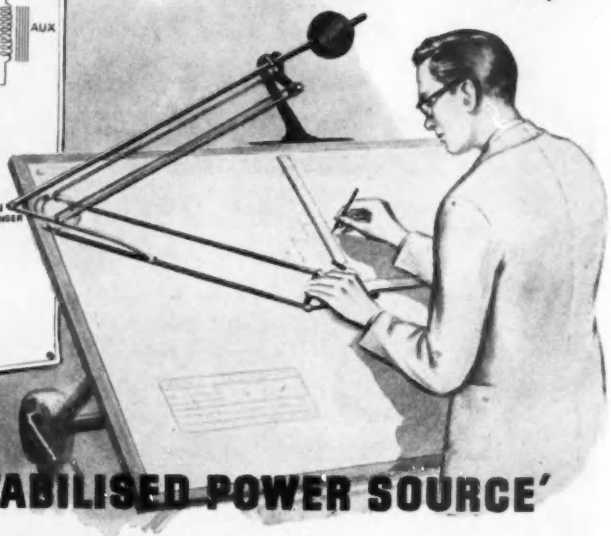


At the Drawing Board Stage–



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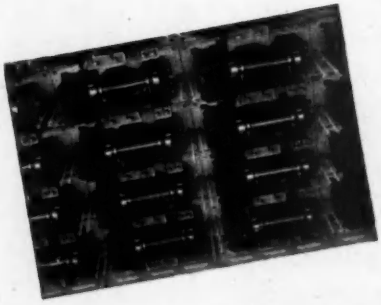

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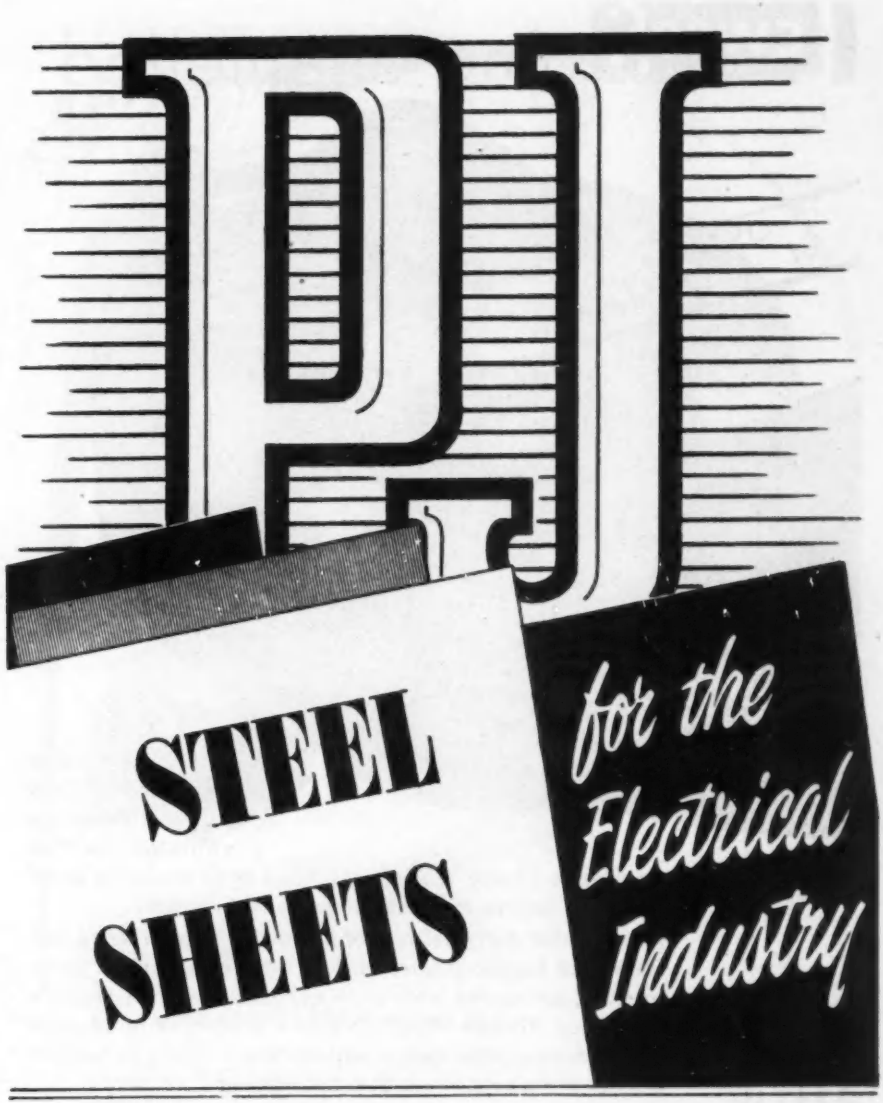

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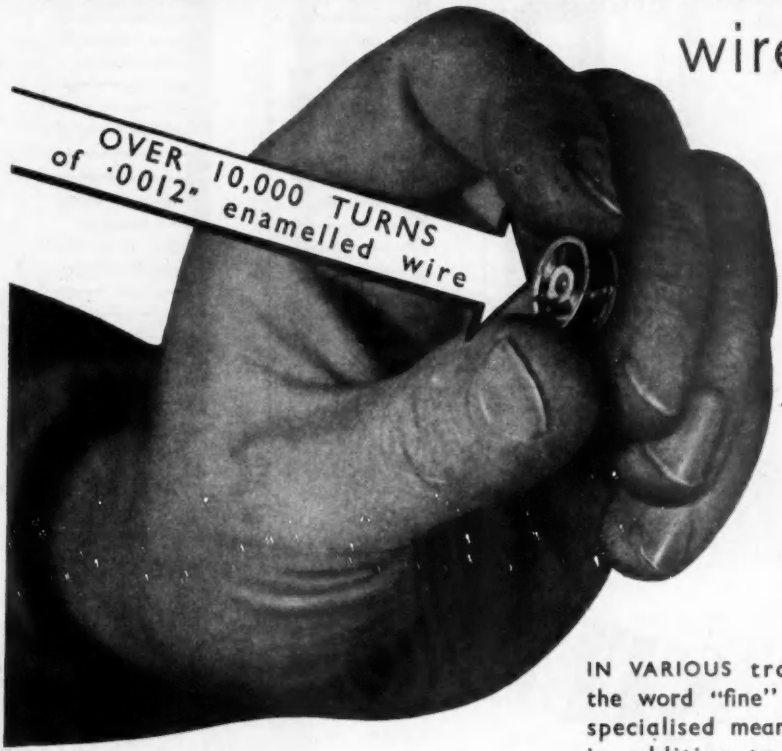

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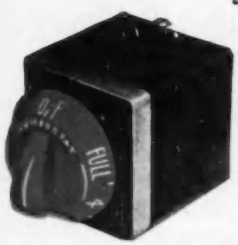

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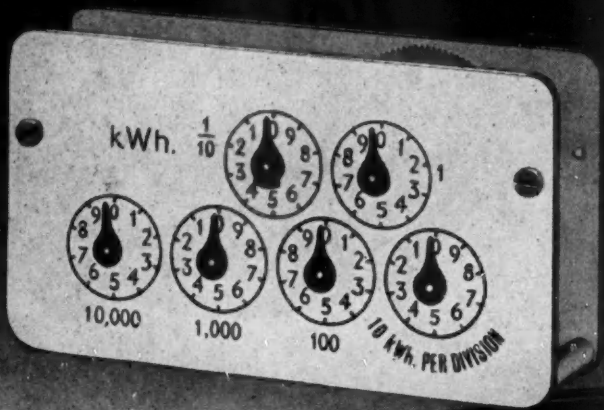

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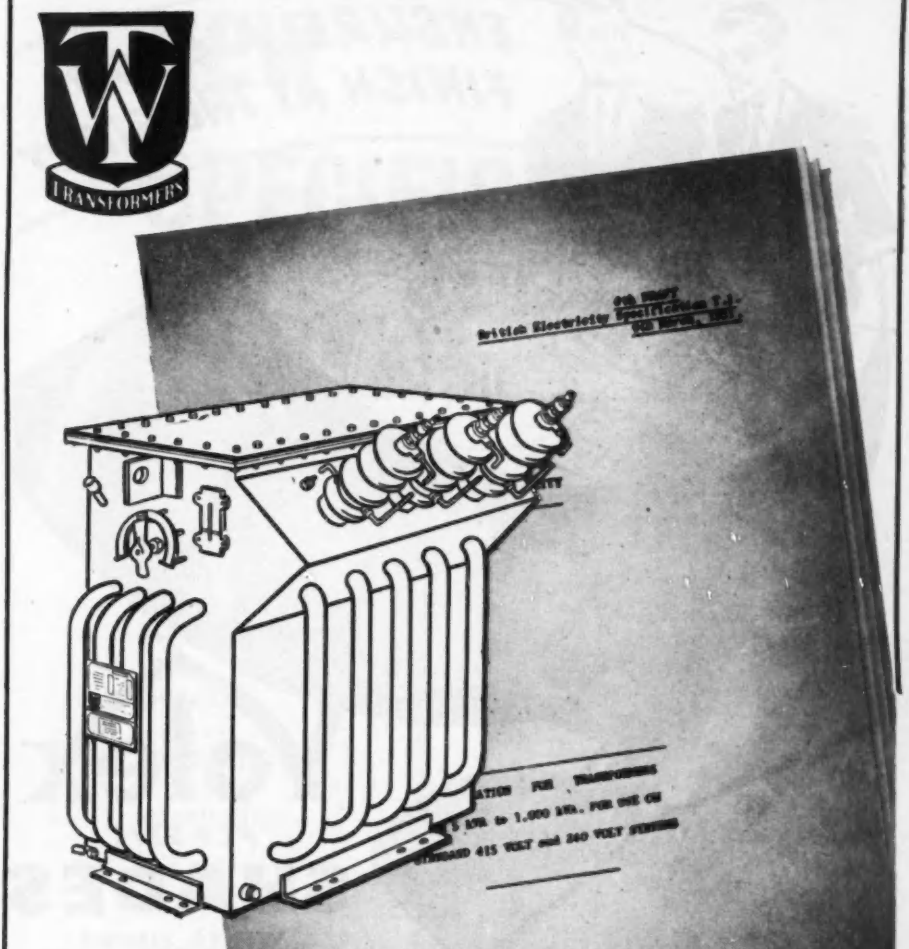

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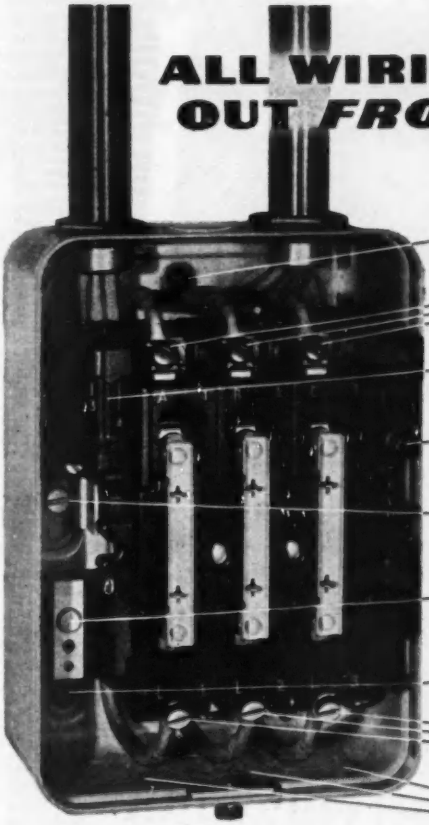

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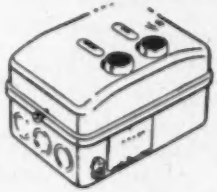

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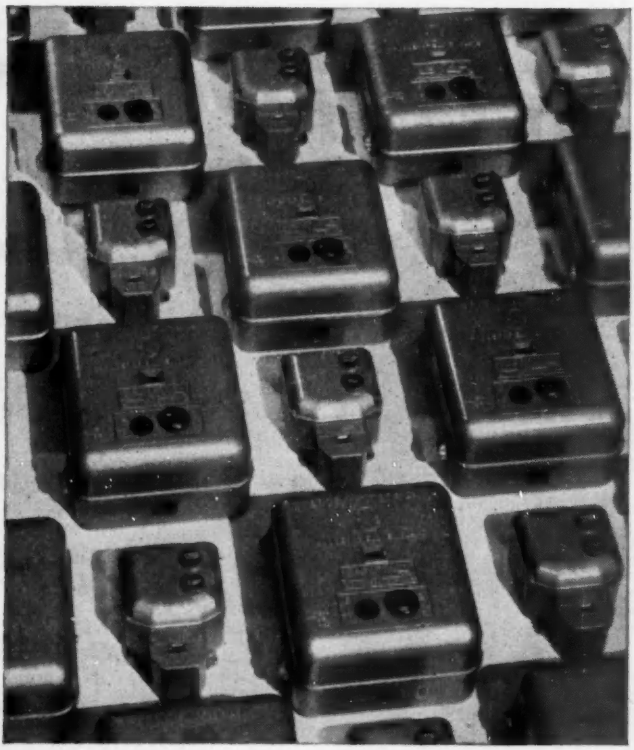

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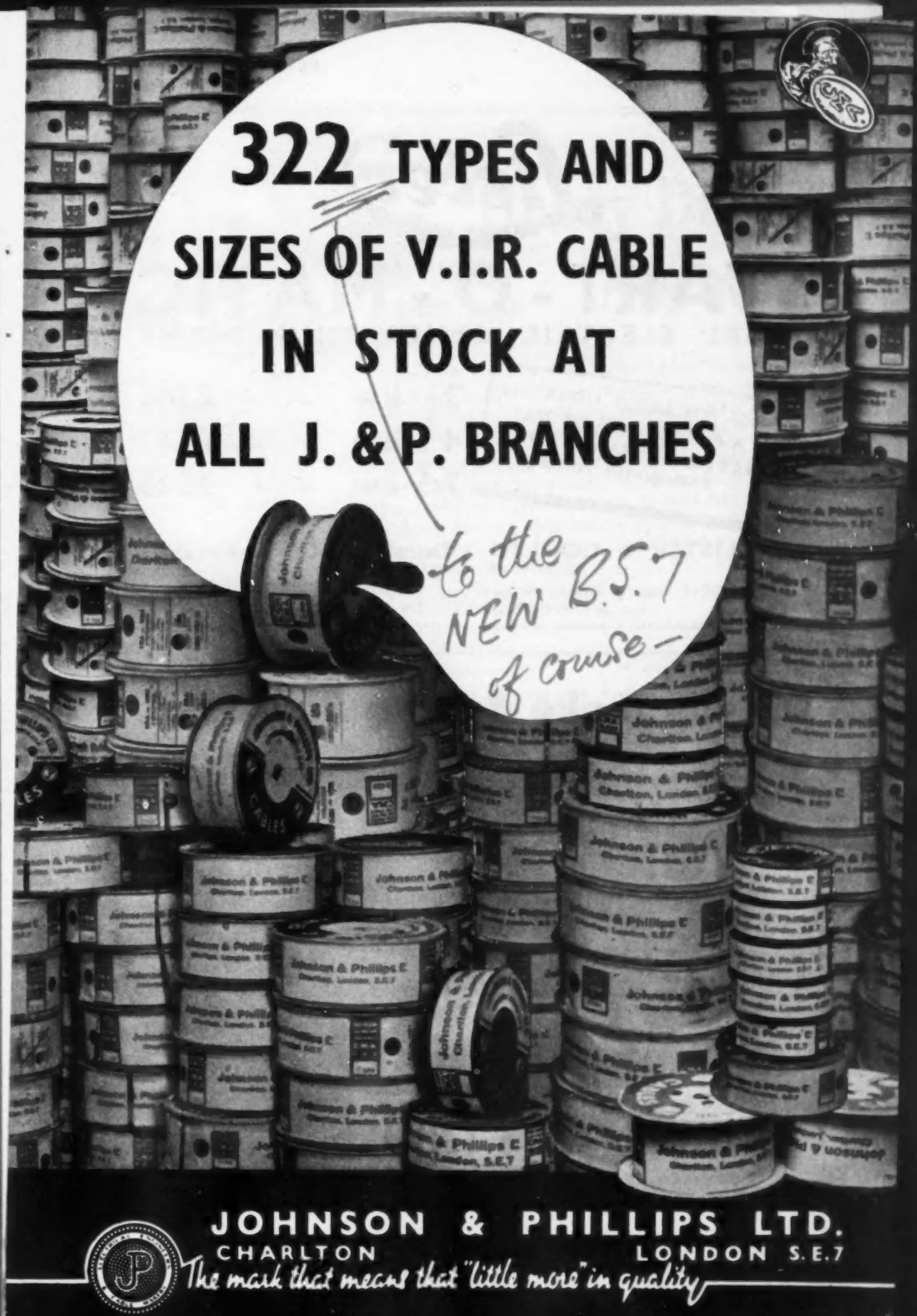
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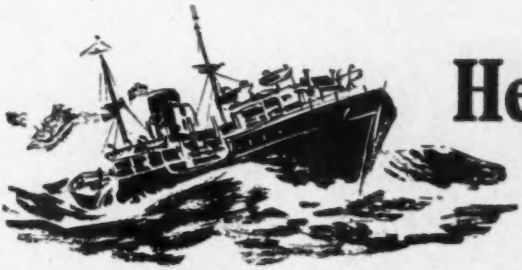

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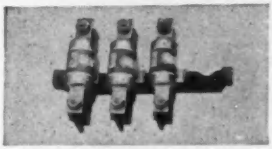
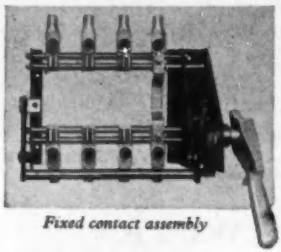


Moving contact—fuse assembly



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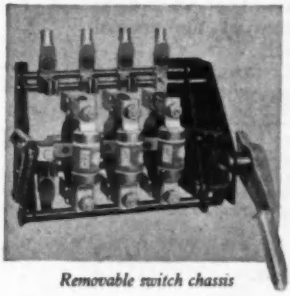

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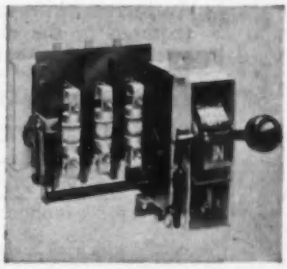

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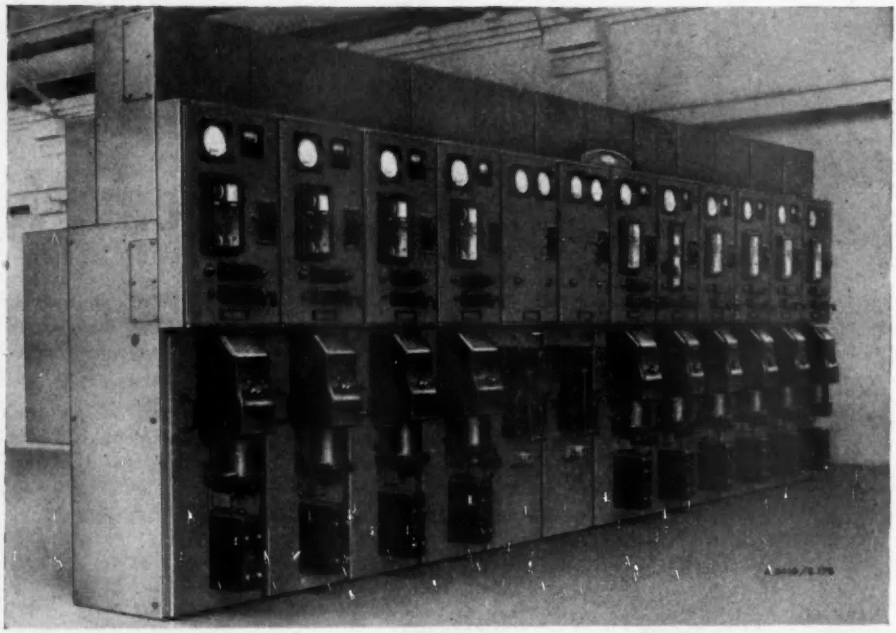

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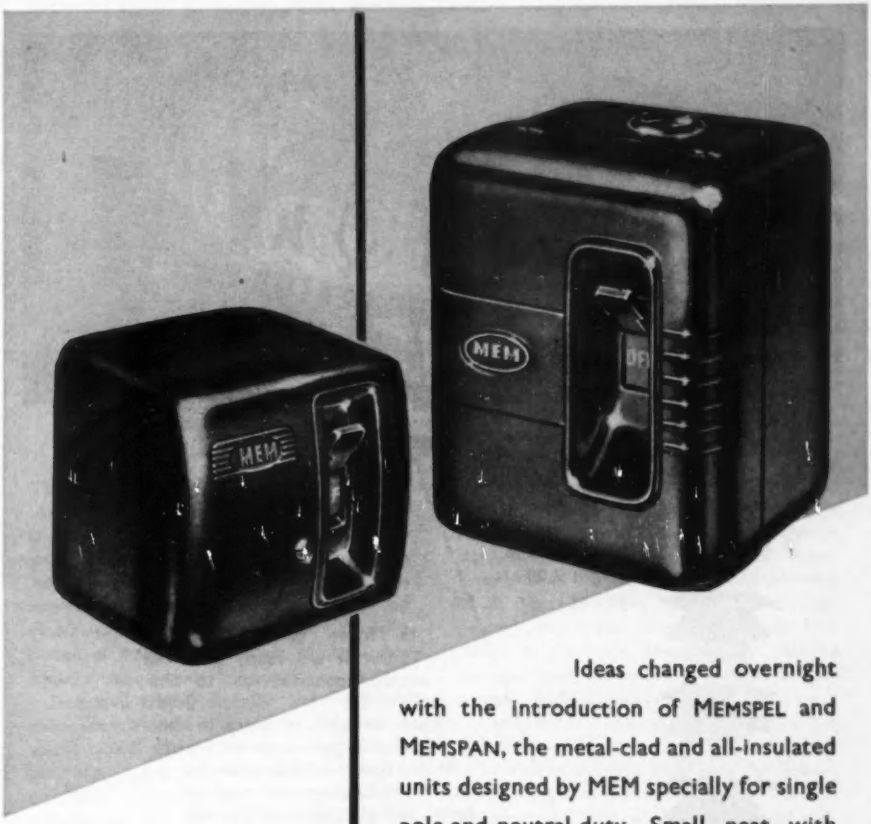

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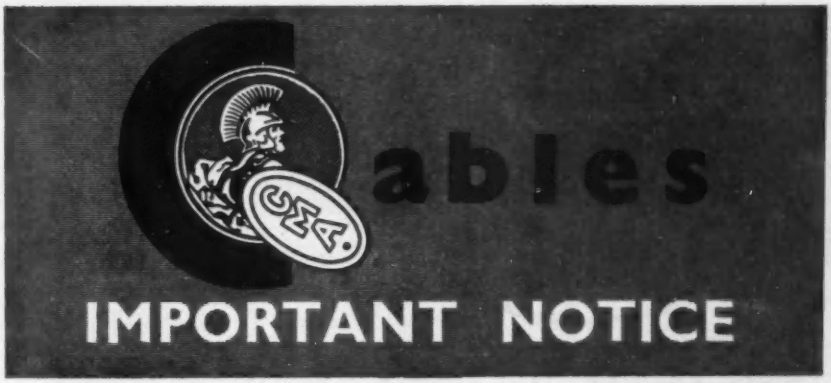

REVISION OF BRITISH STANDARD SPECIFICATIONS

The new British Standards covering Vulcanised Rubber and Polyvinyl Chloride (P.V.C.) insulated cables and flexible cords will be issued by the British Standards Institution in a few days. These new standards represent the culmination of extended and patient experimental work carried out over a period of years by Members of the Cable Makers' Association.

It is well known that the Cable Makers' Association was the first body in the world to standardise Electric Cables and, has, for the last fifty years, set the highest possible standards in the art and science of cable making, and this fact is responsible for the immense prestige behind the trade mark "C.M.A." which is accepted as the hall-mark of quality throughout the world.

To ensure that its reputation is maintained, the C.M.A. requires of its Members a rigid observance of the quality provisions, both technical and manufacturing of the Standards and Formulae of the Cable Makers' Association. This high standard is maintained by periodic testing of samples of cables over a wide range of types selected at random by the C.M.A. Technical Staff.

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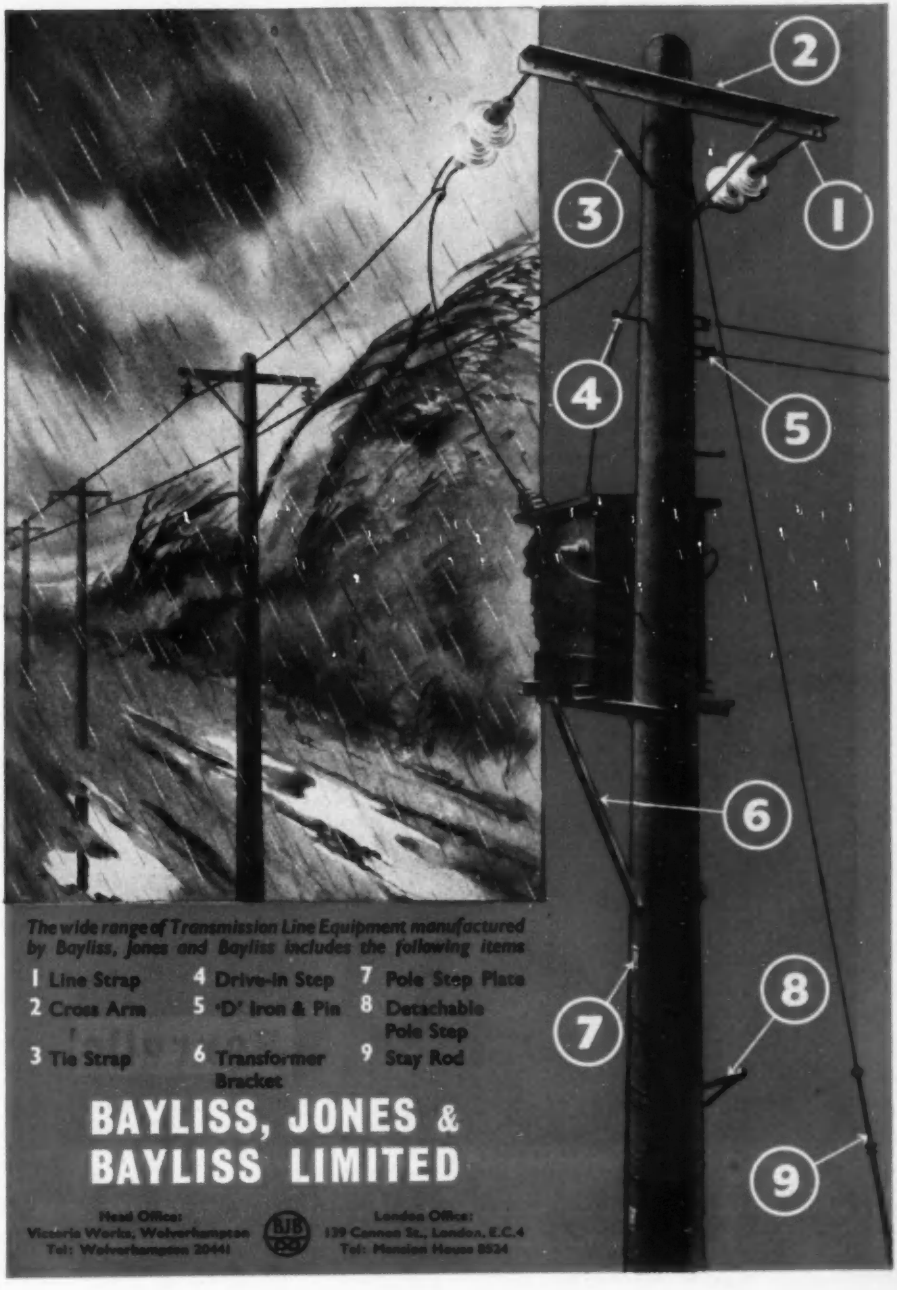

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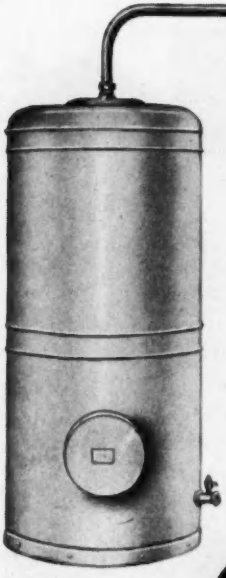

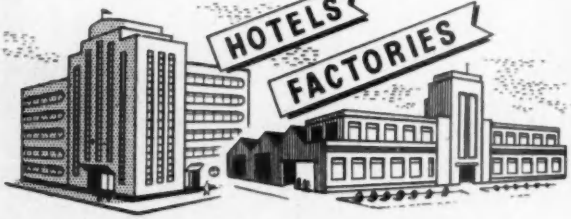

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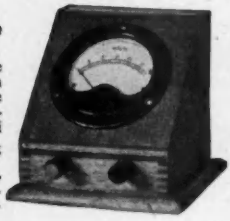

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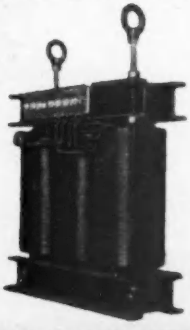

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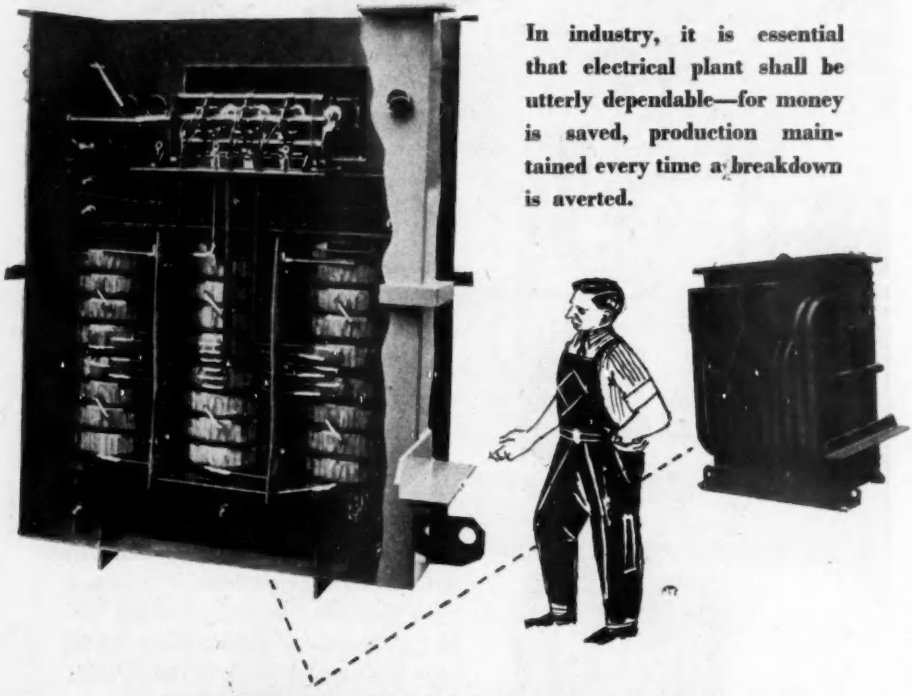

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ELECTRICAL TIMES

Volume 124 No. 3221 30 JULY, 1953

PUBLISHED EVERY THURSDAY

DESIGN FEATURES OF FIVE MODERN POWER STATIONS	189
INSULATION IN N. AMERICA	192
ELECTRICAL CALCULATIONS	193
OUR READERS' VIEWS	194
TRANSISTOR FIELD WIDENS	194
VOLTAGE CONTROL ON NETWORKS, by A. Salzmann, Dipl.Ing., A.M.I.E.E.	195
THERMAL STORAGE IN FLOORS...	199
YESTERDAY'S WASTE—TOMORROW'S RAW MATERIALS	200
THE COST OF NUCLEAR POWER	201
DRUMHEADS FOR DONINGTON	202
PROBLEMS AND PRACTICE IN ENGINEERING ...	203
SUPPLY IN N. IRELAND	204
ARMOURING LARGE CABLES	205
BISCUITS FOR BRAZIL	206
RATIONALISING MACHINING	207
OVERSEAS NEWS	208
PERSONALITIES IN THE INDUSTRY	210
NEW LITERATURE	212
TORONTO'S TALL TASK	214
THE BUYER'S COLUMN	215
NEW ALLOM RANGE OF CONTEMPORARY FITTINGS	217
FLANGE GAPS IN FLP GEAR	218
REMEDYING POLE DECAY	218
SWITCHGEAR—IN A HURRY!	219
THE WEEK IN NEWS	220
Questions in Parliament	225
Electric Supply News	226
Company Activities	226
COMMERCIAL INFORMATION	228
CLASSIFIED ADVERTISEMENTS	47
INDEX TO ADVERTISERS	54

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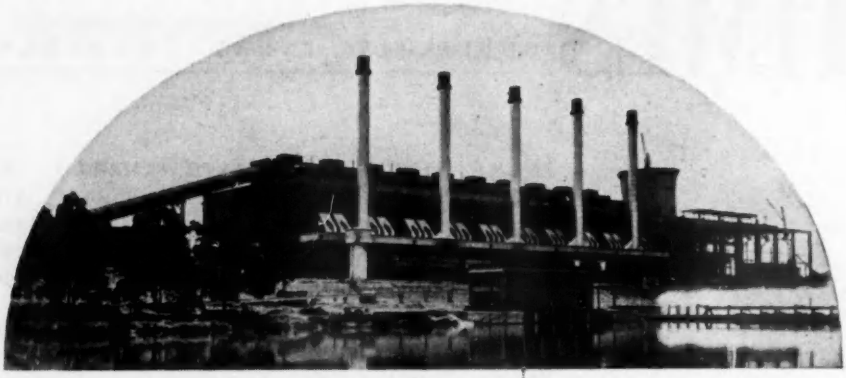

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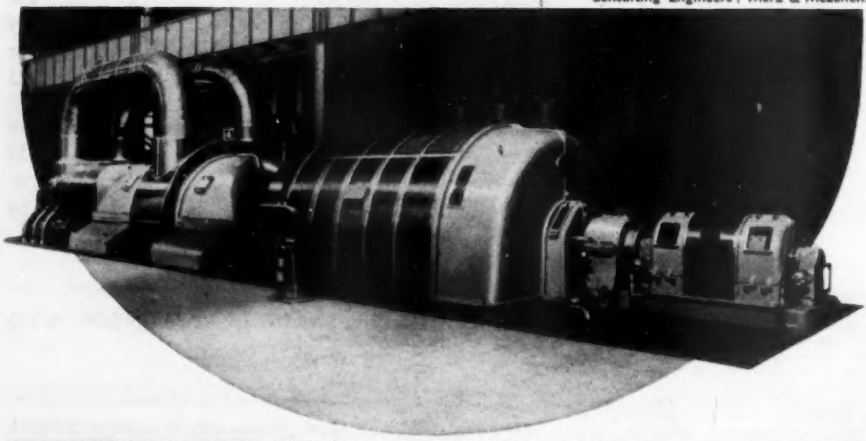


THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

SURVEY ON SMOG

AS a change from such perennial subjects as the destruction of rural amenities, or the wasteful use of that great national asset coal, critics of the supply industry occasionally turn for inspiration to the "smog" with which our large cities are sometimes beset. With vivid word pictures of power station chimneys "belching forth smoke" and a reference to the hundreds of tons burned each day, there is little difficulty in convincing the ill-informed of electricity's guilt. To end such attacks as these, we welcome the setting up of a committee under Sir Hugh Beaver to examine the causes and effects of air pollution and to consider preventive measures. Fortunately, adequate technical information is readily available on the subject, so the report should not be delayed beyond the early part of next year. The direction of their findings also should not be difficult to forecast: it is in the possible preventive measures they may recommend that the greater uncertainty lies. Even here, however, their scope will be limited by the physical limitations ruling today. We feel the electrical industry has everything to gain from this report, providing the evidence offered to the committee on flue gas washing is sufficiently convincing to avoid any definite recommendation on the compulsory installation of expensive plant for this purpose until, at least, its true value is substantiated beyond reasonable doubt.

ANALOGUE ACCURACY

THE relative merits of analogue and digital computors in solving engineering problems are still a fruitful subject of debate, but on the whole the engineer seems to have a preference for the former. This naturally follows from the fact that most engineering problems involve several variables, and in the analogue the effect, on the system as a whole, of changing one of these variables is immediately shown. Further, apart from the initial calculation involved in setting up the analogue, no complex mathematics are generally required in the interpretation of results. Where the principal bone of contention lies, however, is in the degree of accuracy which may be attained. In the digital computor, accuracy of calculations can be carried, theoretically at least, to any degree desired, but in the analogue the accuracy is directly related to the tolerances of the components which go to make up the machine and, in some cases, is also dependent on the arrangement of the individual units as they are set up for a particular task. For most engineering problems the inherent errors lie within the tolerance limits acceptable in the final result, and under these circumstances the analogue is the better tool to use.

MAINTAIN THE MARGIN

FOR the first time since the disastrous experience of 1947, industry in England is this winter to be free from a national appeal to spread its load on the electricity supply system. This is a major landmark on the road back to normality, and it presents both a challenge and an opportunity to the B.E.A. The challenge is to overcome the many difficulties that still surround the problem of meeting power demands in any weather; the opportunity—a chance to take a big step forward towards regaining the unparalleled reputation for reliability and service which the supply industry held before the war. There is a complicating factor this coming winter in the failure of the solid fuel industry to back its propaganda with production of suitable fuel. However, the electric fires which will be brought into use to redress the balance of domestic requirements will, in general, not

affect the peak more than the other sections of the load curve, and in the result the B.E.A., with an anticipated December installed capacity of some 18,600 MW, has a good chance of getting through this winter safely. Unfortunately, there may still be some local shortages of power that will necessitate the co-operation of industry if power cuts are to be avoided, because the transmission system is not as yet sufficiently closely knit; but this problem is receiving attention, as the recent commissioning of a 275 kV link showed. The need now is to maintain the margin in power availability, so hardly won. This may be all too easily lost again if there is external interference by Government planners with the task of commissioning new generating plant at the maximum rate physically possible.

SOOT AND SEWAGE

THE electrical industry has become used to the idea that its new wonder material, germanium, is going to be obtained mainly from hitherto disregarded flue dusts of gasworks. Now it seems that this dependence on the unwitting waste of former days is to extend. Selenium is the subject of a new search in chimneys, this time those of smelting works, where lead, antimony and copper ores have been processed. Selenium is in world-wide short supply, and its use in rectifiers, photo-cells and other electrical devices make this delving into flue dust and slag an urgent task for the chemist of today. Finding valuable materials in disregarded sources is no new experience for him, and for so long as the engineer and the physicist increase their demands for new raw materials, the search will have to be extended. Indeed, even the growing demand for some older and more common substances is leading the chemist into strange paths. Perhaps sulphur provides the best example. The long-term solution of the supply problem here seems bound up with sewage sludge, which can nurture bacteria that bring about the useful extraction of sulphur from otherwise wasted calcium sulphates such as gypsum and anhydrite. So far this sludge is the only sufficiently inexpensive raw material found to be suitable for this purpose. It is a strange comment on this modern and increasingly hygienic age that important sections of industry should become dependent on a foundation of soot and sewage.

HEAT PUMP WEATHER

A FEW years ago, the heat pump held a leading place in the interests of electrical engineers. It offered the prospect of a particularly efficient method of electrical heating, and its apparent promise was causing a flurry of discussion and prediction. Available experimental work was closely analysed and new investigations were started, while a few full-scale installations were planned. Yet in spite of such early enthusiasm, there has so far been no sign of the advance that was expected. Is it possible that the heat pump is being forgotten, as some investigators have suggested, or have unforeseen factors supervened to prevent its development? American experience may be called in as a test, and at first sight it supports the possibility of unreasonable neglect. The number of heat pump installations in the U.S.A. has been increasing at a progressively greater rate over the last few years, and a recently published report notes that more and more manufacturers are indicating their belief in the heat pump's future by offering it as a standardised product for installation. Yet this same report offers a possible explanation of the relatively slower progress made in Britain. There are heat pumps in all but 10 States of the U.S.A., but they are particularly few in number in the area near the north-east coast of that country, where the climate is in some respects like our own. In contrast it is in the warmer regions, such as California, Florida, Texas and Tennessee that the installations are thickest, though Washington and Oregon provide north-western outposts of popularity. It would appear that it is the British climate which condemns the heat pump to a limited usefulness and gives little incentive for swift development.

Meteor

Design features of five Modern Power Stations

Second Summary of their Characteristics

IN our issue of February 11th we published our first digest of post-war power station characteristics. The reason for publication was principally to provide a basis on which easy comparisons could be made. In this issue we publish the second series of five stations, in which the influence of standard sizes is well apparent. No less than twenty-two of the sets included are of 60 MW and only two differ, and then are in the 50 to 60 MW range. Steam pressures and temperatures also lie within comparatively narrow limits of 950 to 975 lb/sq in. and 915 to 940° F.

Skelton Grange

Skelton Grange power station, operated by the Yorkshire division of the British Electricity Authority, is situated south-east of the City of Leeds. The project was developed by Leeds Corporation Electricity Undertaking and construction began in July 1947. Half the ultimate capacity of 360 MW has now been completed. The first of the six 60 MW sets was commissioned in April 1951, and it is interesting to note that this was the first Parsons hydrogen-cooled set in use in this country. The boilers are by International Combustion, and six of 360 klb/hr are already commissioned. The three future units of 550 klb/hr will employ long flame horizontal tilting burners, similar to their predecessors, a new development in this country.

The turbines are housed in a reinforced concrete building with a thin shell roof of pleasing design, which resulted in a great saving of steel and speedy construction of the turbine house.

Brighton "B"

The Brighton "B" station lies near the original Brighton "A" station, but is located on an island adjoining Shoreham Harbour. Construction began in November 1947 and the first 52·5 MW set was commissioned in December 1952, and the second in February 1953. It is hoped to get the third set running this year and the fourth in 1955. The commissioning schedule provides for the fifth unit (60 MW) in 1957. The turbines are by Richardsons Westgarth and the boilers by Babcock and Wilcox. So far four of the latter have been commissioned, the last being in June of this year.

As the station is on an island, and an undertaking was entered into some while ago by the South-Eastern Division to limit the number of overhead lines crossing the harbour, supplies are taken to the "Southern Cross" transmission substation through 132 kV cables, of single core design of 0·3 sq in. copper section with a 12 mm oil duct and single reinforced lead sheath. These cables run through a special tunnel driven 80 ft deep below the harbour.

A description in detail of this station was published in our issue of March 12 of this year.

Littlebrook "C"

Littlebrook "C", which is virtually adjoining Littlebrook "A" and "B" was sanctioned in November 1949. The final design is for 4-60 MW Parsons turbines with eight International Combustion boilers. Located on the Stone Marshes on the south bank of the Thames near Dartford, the site required extensive and close piling before a sound foundation could be obtained. The first set went into operation (with the two associated boilers) in December of 1952. The three

Continued on page 192

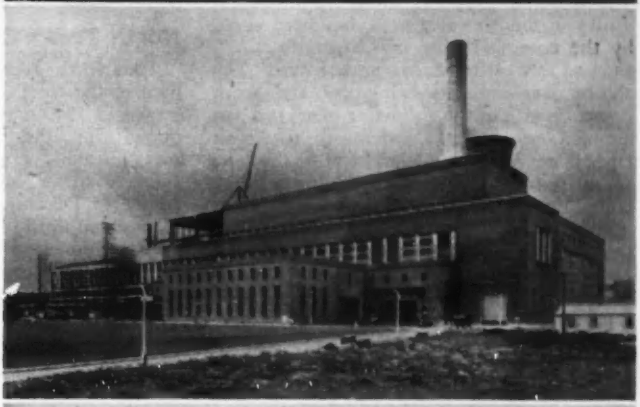
Our heading block shows Brighton "B" station. Photo by courtesy of B.E.A. Headquarters

Power Station Leading Characteristics

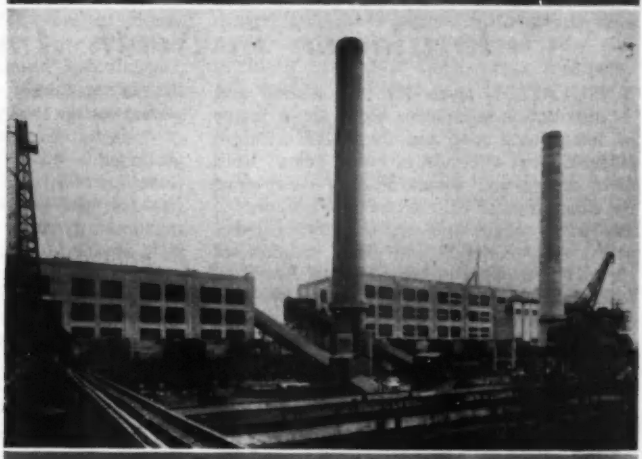
Name of Station	Skelton Grange	Brighton "B"	Littlebrook "C"	Uskmouth	North Tees "C"
Nearest centre	Leeds	Brighton	Dartford	Newport (Mon)	Tees-side
Projected capacity, MW	6×60	4×52·5, 2×60	4×60	6×60	4×60
Present capacity, MW	3×60	2×52·5	1×60	1×60	3×60
Machine arrangement	in line	in line	in line	in line	in line
System arrangement	range	range	range	range	range
Boilers					
Cap., klb/hr (ult.)	6×360+3×550	11×320	7×360	12×360	7×360
Cap., klb/hr (present)	6×360	3×320	3×360	3×360	5×360
Pressure, lb/sq in.	975 975	950	975	950	950
Temperature, ° F	940 940	925	915	925	940
F. wall h.s., sq ft	7,340 10,660	4,350	7,290	4,625	5,174
Boiler h.s., sq ft	4,270 1,790	4,875 4,075	3,245	5,950	6,100
Prim. s'heater, h.s., sq ft	3,850 4,140	13,090 13,750	12,980	10,800	13,200
Sec. s'heater h.s., sq ft	13,500 20,520		2,600	3,960	3,580
Economiser h.s., sq ft	22,848 42,240	18,500	22,848	21,100	17,790
Air heater h.s., sq ft	91,507 129,500	66,200	91,507	51,900	73,000
Furnace vol., cu ft	29,000 45,100	23,500	28,200	26,500	28,000
Release, BTU/cu ft/min	269 262	278	283	—	367
Design C.V.	10,770 10,770	10,000	10,000	11,500	10,000
Type of firing	p.f.	p.f.	p.f.	p.f.	p.f.
H.P. aux. motors/boiler	3,350 4,660	2,169 2,289	2,448	2,500	2,500
Generating Plant					
S.V. pres. lb/sq in	900	900 900	900	900	900
S.V. Temperature, ° F	900	900 900	900	900	925
No. of cylinders	3	3 2	3	2	3
Type of exhaust	twin	twin quad	twin	twin	twin
No. of bleed pts.	5	5 5	5	5	5
Design vac., ins. Hg	28·5	29·0 29·0	28·8	28·9	28·75
Alt. cooling medium	H_2	Air H_2	H_2	H_2	H_2
Fan drive	integral	sep. integral	integral	integral	integral
Generator voltage, kV	11	11·8 11·8	11	11·8	11
Exciter drive	geared	direct direct	geared	separate	geared
Tail-end leads	cable	cable cable	cable	cable	busbar
Unit trans., MVA	6	5 5	5	6	6
Gen. trans., MVA	70	60 65	73	70	70
H.P. aux. motors/set	1,050	1,133 941	719	1,800	1,120
Miscellaneous					
Switching, kV	132	132	132 and 66	132	66
Main s/gear type	o.c.b.	o.c.b. and air-blast	o.c.b.	air-blast	air-blast
Main s/gear, MVA	2,500	2,500	2,000 and 1,500	3,500	2,500
Aux. supply source	b.b. and unit trans.	b.b. and main set	b.b. and main set	b.b. and unit trans.	busbar
H.V. aux. supply, kV	3·0	3·3	6·6	3·3	3
C.W. source	river, sewage, and canal	sea	tidal river	river	river
No. of cooling towers	One (3 sets)	—	—	—	—
C.T. rating, gal/min	43,300	—	—	—	—
Coal storage, tons	120,000	100,000	160,000	108,000	45,000
Coal transport	rail, road	collier	collier	rail	collier
Dust removal	precip.	precip. and mech.	precip.	precip.	precip.
Ash removal	hydro.	hydro.	hydro.	hydro.	hopper
Site area (acres)	200 approx.	30	100 (inc. A & B stns)	604	115·8

NORTH TEES

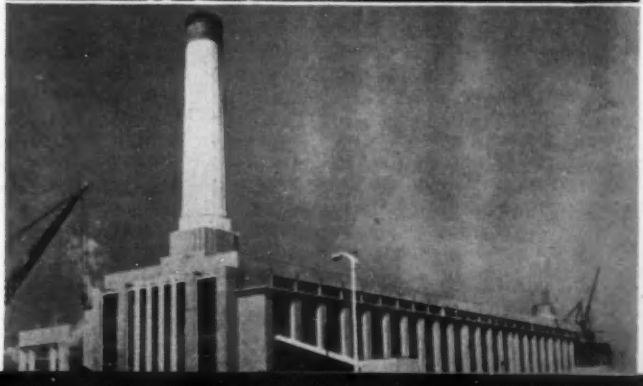
SKELTON
GRANGE



LITTLEBROOK



USKMOUTH



stations, together, have a wide variety of plant, the "A" station having two Parsons 30 MW sets and one B.T.H. 60 MW unit while the "B" station has two 60 MW M.V. sets. The photograph of Littlebrook "C," reproduced on page 191, is by courtesy of Messrs. Sturtevant Ltd., and was provided by the South Eastern Division of the B.E.A.

Uskmouth "A"

The serious power shortage in Wales, caused partially by the concentration of industry in the Newport area, has been eased by the commissioning of Uskmouth "A", situated at West Nash, Monmouthshire. The station was authorised in 1947 and work began on site in the following year. At the moment one G.E.C./Fraser and Chalmers 60 MW set is operating, and five further sets are to follow. The boilers are by Babcock and Wilcox. Provision has also been made for the construction of a further station of the same size to be known as Uskmouth "B" at the same site.

The original site consisted of grazing land some four to five feet below maximum high tide level, and considerable filling was necessary. The sub-soil also presented difficulties as the marl is generally about 60 ft below ground level. To support the station some 9,000 concrete piles varying in length between 50 and 70 ft were needed. As the difference between high and low tides at springs is over 40 ft, a caisson had to be constructed to drop the circulating water pumps below low tide level, and the pumps themselves are located some 62 ft below ground level. When completed the station will alleviate many of the transmission difficulties experienced by the South Wales Division.

North Tees "C"

The North Tees power centre at Billingham in the North Eastern Division was enlarged in 1949 when construction was sanctioned for the "C" station. Progress was unusually rapid, the first of the four Parsons turbo alternators being commissioned in December 1951, followed by the second and third in July and December 1952. Five of the seven Babcock and Wilcox boilers have also been completed. A further extension to the station involving a further 60 MW set and three 360 klb/hr boilers is now in hand. The station is a fairly standard example of modern high heat design.

Insulation in North America

INSULATION levels for transmission and distribution equipment are a major factor in determining cost, and they have therefore received close attention in recent years. Both from design and standardisation viewpoints, the effect impulse voltage has been a subject of continued debate in every country. Current practice in America has been summarised recently in a paper presented to the American Institute of Electrical Engineers by four engineers of the Westinghouse Electric Corpn.

In both the United States and Canada, insulation co-ordination centres largely round the characteristics of lightning arresters, of which three classes are recognised: station, line and distribution. An arrester is rated in terms of the maximum r.m.s. voltage at system frequency against which it can interrupt its power follow-through current and restore itself to an insulator once a surge has passed. Voltage rating is the only relevant figure for valve arresters, but expulsion designs have a fault current rating as well, since the system may determine the follow-through current.

On systems where neutrals are isolated, it is customary to use arresters with ratings equal to the maximum operating phase-to-phase system voltage (100% arresters). A wider range of possibilities exists where systems are grounded. For high-impedance earthing (Petersen coils) 100% arresters are required, but for low impedance earthing, with the maximum dynamic voltage to earth limited to 80% of phase-to-phase, then the so-called 80% arrester may be used. This is one of 80% (or next higher standard) the voltage rating of that used on an isolated neutral. Effective earthing implies X_0/X_1 less than 3 and R_0/X_1 less than unity. On occasion, arresters of a still lower rating may be used.

For four-wire distribution systems, arresters of 75% or less are applicable, this practice being based on experience.

Once arrester levels have been settled, it is necessary to determine the maximum voltage to which protected equipment may be exposed. For substation equipment many factors are involved. In the result, the protected level for an 80% application becomes $3{\cdot}37\ E_m + 30$kV, where E_m is the maximum system voltage. The first factor is 4·22 for 100% applications and 3·17 for 75%.

ELECTRICAL CALCULATIONS

Computor Techniques for Machines, Power Systems and Control Circuits discussed

SIXTY engineers from industry, the B.E.A. research associations, technical colleges and universities gathered recently in the Electrical Engineering Department of Imperial College, London University, to attend a vacation school on analysers and computors. The purpose of the school was to encourage the wider use by electrical engineers of analysers and computors for solving the problems that arise in the fields of electrical machines, electrical control systems and power networks.

In an opening address to the school, Mr. F. J. Lane, Transmission Design Engineer of the B.E.A., stressed the value of vacation schools in providing opportunity for discussion and exchange of information. The first three lectures, which followed, dealt with the general types of problem encountered. Mr. B. Adkins (Imperial College) discussed electrical machines in the first of these, grouping the problems that arise as design calculations and performance calculations, with a further breakdown of each group into routine calculations and research investigations. Dr. J. R. Mortlock (B.T.H.) dealt with power system design problems, and Dr. J. H. Westcott (Imperial College) surveyed the calculations associated with closed-loop control systems.

Mathematics

Dr. W. J. Gibbs (B.T.H.) opened the next section of the course with a lecture on the mathematics of the problems that arise. He showed that such problems first require formulation by the specification of an ideal system which can be represented in mathematical terms, and he followed a review of the type of calculation often required by demonstrating that matrices can assist the orderly arrangement and manipulation of performance equations of all types of systems. This theme of convenience in calculation was taken up by Mr. M. W. Humphrey Davies (Imperial College) who put forward suggestions for processes intermediate between simple slide-rule calculations and the complex methods used in automatic computors. After surveying existing types of hand-operated calculating machines, he demonstrated a convenient method for the solution of sets of linear simultaneous equations, and described an improved type of semi-automatic machine, designed for handling two-dimensional quantities, which is being constructed at Imperial College. Mr. Humphrey Davies concluded by suggesting that semi-automatic machines may be specially suitable for many routine calculations.

Further lectures were given by Dr. J. M. Bennett (Ferranti Ltd.) who described several types of automatic computor, and dealt with details of the methods for handling typical problems; Mr. L. Gosland (E.R.A.) who surveyed analogue computors, network analysers, models and simulators; and Dr. G. R. Slemon (Imperial College) who dealt with the solution of non-linear problems. Dr. Slemon made special mention of the fundamental frequency approach to steady-state non-linear circuits, and showed how this could be applied to both power frequency and stability problems.

Discussion

From the discussions held after lectures and also at the end of the school, it appears that there will be a considerable demand for the facilities of automatic computing machines as these become available and that there is considered to be scope for improvement in desk machines. It is felt that a desk computor with a trained operator would be a useful adjunct to many engineering offices. However, analogue rather than digital devices would often be preferred by engineers because explicit mathematical formulation of the problem is often unnecessary. In such cases the devices used can be made directly analogous to the physical system, with the added advantage in power network and similar problems that the general behaviour of the system can be observed directly. Such devices make it possible for the engineer to solve his problems with only occasional assistance from a mathematician, and the general opinion was that this is an arrangement which is preferable to the use of external computing services.

Our readers' views ...

Domestic Cooker Installations

I NOTE with interest Mr. F. L. A. Morris's letter in the current issue of the ELECTRICAL TIMES regarding domestic cooker installations.

The need for a control unit rated higher than 30 amps was recognised by this Company many years ago. The 45 amp "Simplex" cooker control unit (Cat. No. 3800) was, therefore, introduced.

Although nominally rated at 45 amps the "Simplex" microta slow-break switch movement incorporated in this unit can adequately handle 60 amps, and is therefore suitable for the larger type cooker, of which the "Creda" Comet and the Heavy Duty Restaurant range, are examples. In addition, the range includes standard units to B.S.S.483, and a 60 amp triple pole and neutral control unit specially designed for heavy duty canteen equipment.

It has always been the policy of this department to produce control gear suitable for equipment manufactured by "Creda"—our Domestic Appliance Division.

I shall be happy to provide any further information that Mr. Morris may require.

G. D. Mason
SALES MANAGER,
CONDUIT & SWITCHGEAR DEPT.,
SIMPLEX ELECTRIC CO., LTD.

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Immersion Heater Design

IN your issue of the 2nd July, your contributor to "Problems and Practice" comments upon immersion heater design. We were encouraged to introduce a range of immersion heaters based upon the principle of a fixed setting temperature control as a result of opinions expressed by a great many engineers responsible for long term maintenance, that a major contribution to their troubles has been the adjustable thermostat. We are not criticising the design of this instrument, but where there is a knob that can be "twiddled" it will be twiddled. Actual electrical breakdowns as instanced by your contributor may be rare, but premature scaling in hard water and complaints of excessive consumption due to the thermostat being set higher than is advisable are indeed only too frequent.

We refrain from commenting upon the design of an immersion heater with unshrouded thermostat terminals, uninsulated terminal wiring and we will even pass over the astonishing implication that a thermostat and elements on one head is an "error."

A. J. Wyndham Roberts
SANTON, LTD.
LONDON, W.3.

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Railway Electrification

I WAS particularly interested in your report (July 16) of the proposal by Inverness County Council that the railway from Perth to Inverness should be electrified to permit it to carry an increased capacity without having to undertake extensive civil engineering work to double-track part of the line. Such a procedure has been adopted, I believe, with success abroad, particularly at Annecy, in France, where a similar situation arose.

The estimates put out by the North of Scotland Hydro-Electric Board certainly show at first sight both a substantial capital saving and also a running saving—particularly in coal, and in view of this the reply of the railway authorities will be of more than passing interest, as much of their standard defence—financial restrictions, lack of materials and shortage of manpower, etc.—would appear, in this case, to be inapplicable.

C. Oppenheimer
LONDON, W.C.1.

TRANSISTOR FIELD WIDENS

THE scope of the transistor as an alternative to the thermionic valve has been greatly widened by the development of tetrode and pentode units. It will be remembered that the earlier forms of transistor were mainly diodes and triodes. Introducing the commercial production of these new variants, Mr. James J. Sutherland, general manager of Sylvania Electric Products, said that in a number of cases one tetrode would do the work of two triode transistors and, in some cases, one pentode could do the work of three triodes.

The tetrode unit will be made commercially available about August 15, and the pentode, on which the final tests are now being conducted, is expected to become available later in the year.

It is not thought that these units will entirely displace other types, but they will have a particular application for miniature wireless sets and in car radios.

Voltage Control on Networks

Application of Unswitched Shunt Capacitors on 3-winding transformers

By A. SALZMANN, Dipl.Ing., A.M.I.E.E.

THE growth of power transmission has speeded up the introduction of multi-circuit transformers in transmission systems operating at different voltages.

These units are used (*a*) to interconnect circuits of different voltage rating, (*b*) to supply additional load at a voltage differing from the primary and secondary voltages such as auxiliary supply for power stations and large factories, (*c*) to control load division and short-circuit currents, (*d*) to permit unbalanced loading when the primary and secondary windings are star/star connected, and (*e*) to provide a path for the third harmonic component.

In general three-circuit transformers are divided into two main groups. The first is when the terminals of the third or tertiary winding are accessible. They are brought out and connected to transmission lines (case (*a*)) or to load circuits (case (*b*)). The tertiary winding is connected either star or delta depending on the connection of the primary.

The second is when the terminals of the tertiary winding which in this case forms a closed delta, are not brought out, and the main function of the three-circuit transformer is improvement of the system operation conditions (cases (*d*) and (*e*)).

Thus a number of network problems can be solved by application of three-circuit transformers and among others is the voltage regulation of transmission lines including step-down transformers. For instance, if the voltage is controlled at the receiving end, shunt capacitors connected to the tertiary of a three-winding on-load tap-change unit will improve the voltage regulation considerably as the lagging current flowing through the line and transformer is eliminated. In addition shunt capacitors in these circumstances will relieve system loading.

Three-Winding Transformer[1]

A three-circuit unit is, in fact, a two-winding transformer with a third winding added to it as shown in Fig. 1. The impedances between the windings when reduced to a common kVA base, if using per cent. or per-unit impedances, or reduced to a common voltage base if using ohm impedances, can be replaced by an equivalent group of impedances. The three windings are arranged on each limb concentrically, hence the impedance between the middle winding and each of the other two will be smaller than the impedance between the inner and outer windings. If the inner, tertiary (or T.V.) winding is numbered "3", the middle or h.v. winding "1" and outer or l.v. winding "2", the equations representing the impedance Z_{12} between winding "1" and "2"; Z_{13} between "1" and "3", and Z_{23} between "2" and "3" are $Z_{12}=Z_1+Z_2$ ("3" idle), $Z_{13}=Z_1+Z_3$ ("2" idle), $Z_{23}=Z_2+Z_3$ ("1" idle). Solving these equations for Z_1, Z_2 and Z_3 we obtain the equivalent impedance of each winding as

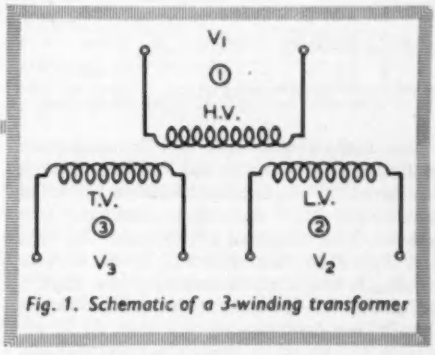

Fig. 1. Schematic of a 3-winding transformer

$$\left.\begin{aligned} Z_1&=\tfrac{1}{2}(Z_{12}+Z_{13}-Z_{23})\\ Z_2&=\tfrac{1}{2}(Z_{12}+Z_{23}-Z_{13})\\ Z_3&=\tfrac{1}{2}(Z_{12}+Z_{23}-Z_{12})\end{aligned}\right\} \quad \ldots\ldots\ldots\ldots (1)$$

The impedance circuit may be represented either as a star or delta circuit assuming the excitation has been neglected. For convenience we are selecting the star circuit, and the equivalent network is shown in Fig. 2.

If z_{12} is the per-unit impedance at a given rated base "P" MVA, and z_{13} and z_{23} the per-unit impedances at a given rated base "P_1" MVA, the per-unit impedances shown in the equivalent circuit must be expressed on an arbitrary base. At a base (say "P" MVA) we obtain

$$\left.\begin{aligned} Z_{12}&=(P/P)\ z_{12}\ \text{p.u.},\\ Z_{13}&=(P/P_1)\ z_{13}\ \text{p.u.},\\ Z_{23}&=(P/P_1)\ z_{23}\ \text{p.u.},\end{aligned}\right\} \quad \ldots\ldots\ldots\ldots (2)$$

TABLE 1

Units		Rated output MVA	Rated voltage kV	Impedance Ref. to 33 kV Ohms	Per unit impedance values	
					Rated base	10 MVA base
Line *		—	33·0	5·7+j 8·15	—	0·00522+j 0·0745
T†	1-2	10·0	33·0	0·875+j 10·9	0·008+j 0·10	0·008+j 0·10
	1-3	3·6	11·0	1·05+j 18·0	0·035+j 0·0595	0·00967+j 0·165
	2-3	3·6	1·5	1·2+j 5·3	0·042+j 0·0175	0·011+j 0·0485

* 13 miles 0·1 sq in. O.H.L. † Tap change range ±10%. 1=H.V. 2=L.V. 3=T.V.

It is interesting to note that the magnitude of Z_1 is smaller than Z_2 and Z_3 if the winding numbered "3" is the inner winding, "1" the middle and "2" the outer winding. This follows from equation (1) because $Z_{23}>Z_{13}$ and $Z_{23}>Z_{12}$. Alternatively, if the primary winding is the outer, the secondary the middle, and the tertiary the inner winding, Z_3 is smaller than Z_1 and Z_2.

This feature of a three-circuit transformer will have an effect on load division between three winding units, 3-winding and 2-winding units, and on short-circuit currents.[2]

In general star equivalent circuits facilitate the solution of problems such as (*a*) the division of load between two or more 3-circuit units, (*b*) the division of load between three and two winding transformers, (*c*) the primary loading (when, for example, the secondary circuit supplies power at lagging power factor and the tertiary circuit power at leading power factor), (*d*) the loading in the case of two primary circuits and one load circuit, and (*e*) the voltage regulation.

In the following analysis it is proposed to deal only with voltage control which falls under heading (*e*).

Voltage Control

Let us consider a simple network and its equivalent circuit shown in Fig. 3. It is assumed that the voltage on busbars "A" is maintained at V_R kV and the tertiary winding of the 3-circuit transformer T_1 at the receiving end is unloaded. The transformer is an on-load tap-change unit having a tap range of, say, $\pm s\%$. The voltage on busbars "C" is maintained at V kV if the voltage drop ΔE_{AC} in the line including the transformer is less than $s\%$ because of the tap range $\pm s\%$.

If $\Delta E_{AC}=s\%$ the voltage level at "C" is raised automatically by adjustment of the transformer tappings on the h.v. side. Thus the turn ratio is reduced by $s\%$ in order to maintain the voltage at "C" at a level Vr kV. Since the nominal ratio is equal to $n=V_R/Vr$, the ratio due to tap change is

$$\left[\frac{(V_R-0{\cdot}01\times s\times V_R)}{Vr}\right]$$

the relation between these ratios is

$$t_R=\frac{(V_R-0{\cdot}01\times s\times V_R)Vr^{-1}}{V_R\,V_r^{-1}}=1-0{\cdot}01\ s.$$

For $s=10\%$, t_R is equal to 0·9. The voltage at the receiving end (h.v. side) is, therefore, $t_R\ n\ V_r$, and on the bus-bars "C" is $t_R\ n\ V_r/n\ t_R = V_r$ kV.

In fact the voltage at "C" is less than V_r kV because the current flowing through the transmission line and T_1 is increased from

$$I^1=\frac{I_L}{V_R/V_r}=I_L/n \text{ to } I=\frac{I_L}{n\ t_R}=I^1/t_R \quad \ldots(3)$$

This is due to changing the transformation ratio. Thus with a reduced ratio $t_R<1$, the line current is increased, and consequently the voltage drop ΔE_{AC} from $s\%$ to $s/t_R\%$.

A voltage drop, say $\Delta E_{AC}>s\%$, will decrease the voltage V_r considerably because there are no spare taps at hand; (tap range $\pm s\%$). It should be noted that the change of reactance due to tap position variation on the transformer can be disregarded, as the influence of changes of transformer reactance on the total system reactance is negligible.

It follows that voltage regulation by means of adjusting the turn ratio of the transformer for the purpose of maintaining constant voltage V_r on bus-bar "C" has its limitation for transformer feeders particularly with large reactances and low p.f. These difficulties are overcome by raising the voltage level on the h.v. side by using shunt capacitors connected to the tertiary winding.

Static shunt capacitors in conjunction with on-load tap-change transformers should be considered as supplementary devices for voltage control. In addition they reduce system losses and relieve system loading.

The relation between voltage rise and capacitor output is given by

$$e_c=\frac{X\ Q_c}{V_R^2}\ \text{p.u.} \quad \ldots(4)$$

where e_c=per-unit voltage rise due to the capacitor; X=the reactance and is equal to

($X_L+X_1+X_2$) (See Fig. 3b) expressed in ohms and referred to the voltage base V_R; Q_c=output of the capacitor expressed in MVAr and V_R=line-to-line voltage in kV at the point of application prior to the connection of the capacitor.[3]

The per-unit line and transformer regulation is therefore

$$e_l=e_r+e_x-e_c \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where e_r=per-unit resistive voltage drop and is equal to $(MW\times R)/V_R^2$ and e_x per unit reactive voltage drop and is equal to $(MVAr\times X^1)/V_R^2$ prior to the application of the capacitor. In these equations R represents the resistance expressed in ohms and referred to the voltage base V_R and equals ($R_L+R_1+R_2$) (see Fig. 3b). X^1 represents the reactance in ohms and is equal to ($X_L+X_1+X_2$); MW=active load expressed in megawatts and MVAr=reactive load expressed in megavars. For practical calculations this formulae is sufficiently accurate.

Application

A single-circuit three-phase transmission line shown in Fig. 3 supplies substation "B." Load demand is 6 MVA at lagging power factor 0·8. The system data are given in Table 1 and it is assumed that the effects of capacitances and conductance are negligible due to the short line. It is required to determine (*a*) the voltage on bus-bars "C" with the tertiary winding idle, (*b*) the voltage regulation with unswitched capacitors rated at 3·6 MVAr and connected to the tertiary winding, and (*c*) the voltage regulation at no load with shunt capacitors left in the circuit. The calculations are based on the assumption that the voltage at the supply point (A) is maintained constant at 33 kV.

Solution

Circuit constants.—Applying the per-unit method[4], the impedance values of the equivalent circuit are obtained from equ. (1) and from the formulae

$$Z=\frac{Z\ (Ohms)\ MVA\ (Base)}{V_L^2}\ p.u. \quad \ldots(6)$$

where Z = impedance expressed in ohms, and V_L = the line to line voltage. Alternatively the per unit value can be evaluated from

$$p.u.=\frac{Actual\ Value}{Base\ Value} \quad \ldots\ldots (7)$$

Impedances

Transmission line.—$Z_L=(5{\cdot}7+j\ 8{\cdot}15)\ (10/33^2)$ $=0{\cdot}0522+j\,0{\cdot}0745$ p.u. (eq. (6).)

H.V. to L.V.: $Z_{12}=(0{\cdot}008+j\ 0{\cdot}1)\ (10/10)$ $=0{\cdot}008+j\ 0{\cdot}1$ p.u.

Transformer: T_1

H.V. to T.V.: $Z_{13}=(0{\cdot}0035+j\ 0{\cdot}0595)\ (10/3{\cdot}6)$ $=0{\cdot}00967+j\,0{\cdot}165$ p.u.

L.V. to T.V.: $Z_{23}=(0{\cdot}0042+j\ 0{\cdot}00175)\ (10/3{\cdot}6)$ $=0{\cdot}0117+j\,0{\cdot}0485$ p.u.

Equivalent circuit: Substituting above values in equ. (1) we obtain $Z_1=0{\cdot}003+j\,0{\cdot}109$ p.u., $Z_2=0{\cdot}005-j\ 0{\cdot}0082$ p.u., $Z_3=0{\cdot}0066+j\,0{\cdot}056$ p.u. Ohm values referred to the 33 kV side give us $Z_1=0{\cdot}326+j\ 11{\cdot}7$ ohms, $Z_2=0{\cdot}544-j\,0{\cdot}89$ ohms, $Z_3=0{\cdot}72+j\,6{\cdot}1$ ohms (eq. (6).)

With nominal transformer ratio n=33/11, and unloaded tertiary winding, the voltage on the 11 kV side can be obtained as follows: The best way to solve the problem is to use the trial and error method, as the bus-bar voltage at "C" is unknown. A first approximation is to refer the power factor and load to the rated voltage (11 kV).

Load:

$$(6{\cdot}0/10{\cdot}0)\angle 36{\cdot}6^\circ=0{\cdot}6\angle 36{\cdot}6^\circ \text{ p.u. (eq.(7).)}$$

Current: i_L

$$=\frac{6\times 10^3\angle 36{\cdot}6^\circ\sqrt{3}\times 11}{\sqrt{3}\times 11\times 10\times 10^3}=0{\cdot}6\angle 36{\cdot}6^\circ \text{p.u.}$$

(eq.(7).)

Voltages: At busbars "A" the voltage is maintained constant: $(1{\cdot}0/0^\circ$ p.u.). At bus-bars "C", $v_2=1{\cdot}0/0^\circ-(i_L\ (Z_L+Z_1+Z_2))$

$=0{\cdot}9085-j0{\cdot}0622=0{\cdot}91\angle 3{\cdot}9^\circ$ p.u.

Actual value: $11{\cdot}0\times 0{\cdot}91\angle 3{\cdot}9^\circ=10$ kV (eq. (7).)

$$\text{Regulation (\%)}=\frac{11-10}{10}\ 100=10\%$$

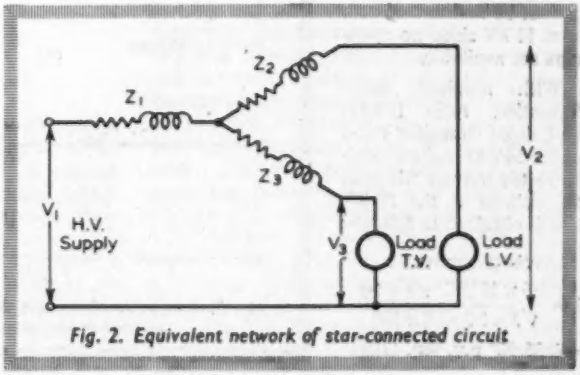

Fig. 2. Equivalent network of star-connected circuit

Derivation of Accurate Voltage Value

The vector product of the conjugate of the voltage, $\bar{v}_2$, $=0{\cdot}91/3{\cdot}9°$ p.u. and the vector current i_L^1 gives the power as $0{\cdot}6/36{\cdot}6°$ p.u., in the load circuit. Thus we obtain:—

$$i^1_L \times 0{\cdot}91/3{\cdot}9° = 0{\cdot}6\angle 36{\cdot}6°$$ p.u.;

$$i^1_L = 0{\cdot}662\angle 40{\cdot}5°$$ p.u.

Actual current value for the 33 kV side is thus

$$(0{\cdot}662\angle 40{\cdot}5°) \times \frac{10\times 10^3}{\sqrt{3}\times 33} = 116\angle 40{\cdot}5°\text{A}$$ (eq. (7))

and the p.u. voltage is

$$V_2^1 = 1{\cdot}0/0° - (i^1_L(Z_L+Z_1+Z_2)) = 0{\cdot}895\angle 4{\cdot}1°$$ p.u.

Thus for the 11 kV circuit the actual voltage is $0{\cdot}895\times 11 = 9{\cdot}85$ kV (eq. 7), and for the 33 kV circuit it is $0{\cdot}895\times 33 = 29{\cdot}55$ kV (eq. (7)). The regulation then becomes $\frac{11-9{\cdot}85}{9{\cdot}85}100 = 11{\cdot}65\%$

To maintain 11 kV on the bus-bars "C" the voltage level should be raised 11·65% by adjustment of the transformer tappings. Since the tap range is ± 10%, the turn ratio can be reduced only by 10%. The voltage referred to the 11 kV side is therefore equal to $29{\cdot}55/(n\times t_R) = 29{\cdot}55/(3\times 0{\cdot}9) = 10{\cdot}9$ kV.

In fact the voltage on bus-bars "C" is lower than 10·9 kV, since the current flowing through transmission line and T_1 is increased by transformation ratio adjustment. Consequently the regulation, REG% = 11·65/0·9 = 12·9%. Actual value on the 33 kV side is $33-(12{\cdot}9\times 29{\cdot}55)/100 = 29{\cdot}29$ kV and on the 11 kV side $29{\cdot}29/(n\times t_R) = 29{\cdot}29/2{\cdot}7 = 10{\cdot}84$ kV.

It is apparent that voltage regulation by transformation ratio adjustment is limited. When the load is further increased, the voltage on bus-bars "C" cannot be maintained at a level 11 kV since no spare taps are available.

With nominal transformation ratio (33/11) and shunt capacitor rated at 3·6 MVAr and connected to the tertiary winding, the voltage on the 11 kV side is obtained as follows:

Tertiary current:

$$i_t = \frac{3{\cdot}6\times 10^3/90°\sqrt{3}\times 1{\cdot}5}{\sqrt{3}\times 1{\cdot}5\times 10\times 10^3} = 0{\cdot}35/90°$$ p.u. (eq. (7).)

Secondary current: $i_L^1 = 0{\cdot}662\angle 40{\cdot}5°$ p.u.

Total current in the H.V. winding:

$$i_H = i_T + i^1_L = 0{\cdot}507\angle 7{\cdot}7°$$ p.u.

Actual value on the 33 kV side: $175\times 0{\cdot}507\angle 7{\cdot}7° = 89\angle 7{\cdot}7°$ amps (against $116\angle 40{\cdot}5°$ A without capacitor).

Voltage: $v_2'' = 1{\cdot}0/0° - (i_H(Z_L+Z_1)) - (i^1_L Z_2) = 0{\cdot}975\angle 4{\cdot}9°$ p.u. Actual value on the 11 kV side is then $11\times 0{\cdot}975 = 10{\cdot}7$ kV and the % regulation is $\frac{(11-10{\cdot}7)}{10{\cdot}7}\cdot 100 = 2{\cdot}8\%$. Similarly on the 33 kV side the actual value is $33\times 0{\cdot}975 = 32{\cdot}1$ kV. As a check:—$10{\cdot}7\times(33/11) = 32{\cdot}1$ kV.

It is apparent that the voltage drop in the line including the transformer is reduced to about ¼ of the drop without capacitor and the line current is reduced to about 27%.

To maintain 11 kV on bus-bars "C", the voltage level should be raised 2·8%, ($t_R = 0{\cdot}972$), and the voltage is then equal to $32{\cdot}1/(n\times t_R) = 32{\cdot}1/3\times 0{\cdot}972 = 11$ kV. (Tap change adjustment will be in two steps each of 1·44%.)

In the case of a tee-circuit branched off from the transmission line, the bleed-off load will further increase the voltage drop ΔE_{AC} but the level at "C" can be maintained at 11 kV since we have several spare taps in hand.

Without the application of transformation ratio adjustment, the rated output of the shunt capacitor has to be increased according to eq. (4) in order to compensate the total voltage drop ΔE_{AC}. In general it is desirable,

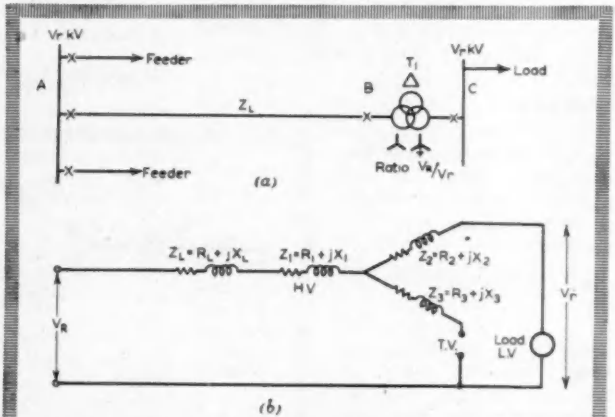

Fig. 3. Schematic of a single circuit 3-ph. transmission line as used in the example in the article

as far as it is practically possible, to control the voltage by capacitors and on-load tap change transformers operating on the positive range of the tap changing device (0% to +10%) in order to reduce system losses. Voltage control by means of capacitors and transformers operating on the negative range of the tap changing device (0% to −10%) increases the copper losses of the system, and also the iron losses of the transformer due to increased flux density, particularly when operating on the −10% tapping.

However, in our case it will prove impracticable to increase the rating of the unswitched capacitors because (a) the output will be larger than the rating of the tertiary winding, and (b) the voltage rise at no load becomes excessive and is outside the range of the tap changing device.

Voltage rise at no load due to the leading current flowing through line and transformer reactance should not become excessive. In conjunction with on load tap change transformer, the capacitors are left permanently in circuit (unswitched capacitors) and there is no need to be flexible in output (switched capacitors) provided the voltage rise at no-load is within the range of transformation ratio adjustment.

In our case the voltage rise should be less than +10% because of the tapping range. With nominal transformation ratio, the voltage rise is equal $e_c = XQ_c/V_R^2$ (eq. (4).) Substituting for $X = (j8{\cdot}15 + j11{\cdot}7 + j6{\cdot}1) = j25{\cdot}95$ ohms for $Q_c = 3{\cdot}6$ MVAr and $V_R^2 = 33 \times 33 = 1090$ we obtain $e_c = 0{\cdot}0855$ p.u. or 8·55% and the voltage rise is within the tap change range. To maintain 11 kV on bus-bars "C" at no load, the voltage level is to be reduced 8·55% by increasing the turn ratio approximately 6 taps ($t_R = 1{\cdot}0855$) and

$$V_r = \frac{t_R 33}{n \times t_R} = \frac{1{\cdot}0855 \times 33}{3 \times 1{\cdot}0855} = 11 \text{ kV}$$

will be maintained at no load.

Conclusion

Summing up we can draw the following conclusions: Shunt capacitors connected to the tertiary winding of an on-load tap change transformer improve voltage regulation, relieve system loading and reduce system losses. They can be left permanently in circuit at no load (unswitched capacitors) provided the voltage rise is not larger than the positive range of the tap changing device. If the voltage rise at no-load is outside the range of transformation ratio adjustment, switched capacitors, flexible in output, should be given consideration.

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THERMAL STORAGE IN FLOORS

AMONG methods of warming buildings, the floor heating system has lately been receiving attention. Although this method of heating is gaining in popularity, little absolute data have yet been made available on the subject. For that reason the work being carried out by Mr. N. S. Billington and reported in full in the *Journal of I.H.V.E.* is of considerable interest. The latest two of the articles on this subject include the problem of losses from heated floors and experiments with intermittently operated floor panels.

In the first of these, the heat flow through the ground floor is regarded as being made up of two components: a central loss through the middle of the floor, depending only on the internal temperature and that of the earth, and an edgewise loss depending on the difference between the outdoor and indoor temperature. Experimental results are given from the work carried out in the laboratory of the National College of Heating, Ventilating, Refrigeration and Fan Engineering, and these results are compared with those derived on a theoretical basis.

In the second paper an account is given of experiments with intermittently operated floor panels. These panels were each about 270 sq ft in area and were identical in all respects save that one had ½ in. insulating board beneath the pipes and round the edges. Each panel was equipped with ½ in. bore steel pipes supplied with hot water by means of an electric heater, the input being measured from the readings of kWh meters. The panels were warmed for two days and were unheated for five days in each week. Significant facts associated with this experiment were that the uninsulated panel required 25% more heat than the insulated one.

An analysis showed that the losses were about 28% of the total input. The quantity of heat stored in the insulated floor during each cycle of operations was about 77,000 B.T.U. per cycle, but the uninsulated one had substantially greater storage, due to lack of insulation underneath.

Yesterday's Waste —Tomorrow's Raw Materials

Chemical Research points way to new Supplies

LAST week in the House of Commons the Minister of Materials stated that the supply of most raw materials is at present keeping pace with demands. This supply position cannot be taken for granted, however, and a principal concern of the D.S.I.R. chemical research laboratory today is the evolution of new and improved methods of obtaining materials of growing importance.

Something of the progress made in this fascinating field is recounted in the report of the laboratory's work for 1953. The requirements of the electrical engineering industry for such elements as germanium and selenium is leading research chemists into strange by-ways of investigation, while the country's demand for sulphur, to which the engineering industry adds its share, is causing the net of inquiry to be cast very wide.

Germanium, a metal whose properties provide the basis for the transistor, has been obtained in progressively pure form. Special attention has had to be given to the elimination of the arsenical impurities which may impair electrical performance, and the proportion of arsenic present in the best samples has been reduced to 0·005 parts per million of germanium dioxide. When the electrical properties of germanium metal obtained from this purified dioxide were studied at the Radio Research Station, they were found to be only about the same as that of the commercial product, so it is considered that there is little advantage in attempting further purification. This development work has been of value however, for it has produced a simpler method of purification which has been used by at least one concern.

Analysis

A special problem that arises for the chemist is the detection of germanium in such unusual sources as flue dust—the main source of supply in Great Britain. Methods of analysis are being developed capable of dealing with proportions like 0·3% germanium in flue-dust, and 35 parts per million in coal. At these extremely low proportions the chemist has difficulty in securing agreement between alternative methods of measurement.

Selenium is, of course, in great demand for such apparatus as rectifiers and photo-cells, and there is a world-wide shortage of it. Flue dusts are again a possible solution, for the metal is widely spread in occurrence. The Chemical Research Laboratory has obtained a number of samples of flue dusts and slags from the smelting of sulphide ores of copper, lead and antimony, and in about half of these there have proved to be detectable amounts of selenium. Now the continuation of this work into the field of quantitative determination is awaiting the development of suitable techniques of analysis: there is irony in the fact that a photo-electric method at present appears the most promising!

Sulphur

Finally, sulphur. Although there is no absolute world shortage of this essential mineral and its compounds, there are apparent shortages in particular localities. In the short term, there are prospects of increased home supplies from such sources as anhydrite, spent oxide and flue gases. More interesting and promising as a long-term possibility, however, is the microbiological production of sulphides and sulphur from the large deposits of sulphate (anhydrite and gypsum) which exist in the United Kingdom.

The important technique employed is the action of a certain type of bacteria on a sulphate, with the production of a sulphide. For industrial success a cheap source of "food" for the bacteria is required and such unusual industrial substances as distiller's slop, dried whey, lactic acid, calcium lactate liquor, seaweed chemicals, settled sewage and sewage sludge have all been used in experiments. Only the last (sewage sludge) is sufficiently plentiful and inexpensive for a practical process.

Thus it is the waste products of former years that are holding the highest promise of fulfilling the highly technical requirements of the electrical engineer of today. The chemist is having to exercise his skill to the highest degree to provide the pure materials which the researches of the physicist and the engineer have shown to possess desirable properties.

The Cost of NUCLEAR POWER

IN Great Britain statements on the economics of nuclear power production have been guarded. As recently as in June, Sir John Hacking in his presidential address to the British Electrical Power Convention, could go no further than to say that for the natural uranium reactor, "both capital cost and fuel cost are to a great extent speculative, and reliable comparisons will only be possible after practical working experience." For breeder reactors, he considered the cost outlook to be even more obscure.

Combined Report

In America, where combined teams of electricity supply authorities and chemical firms have been studying nuclear power station design, there has been, perhaps typically, less reticence. An example is given by the report of the Pacific Gas and Electric Co.—Bechtel Corporation team, which was recently summarised by our U.S. contemporary *Electrical World*.

The report presents the conclusion that the costs of construction, and operation of water-cooled thermal reactors may be predicted with fair accuracy, and detailed design started promptly. This type of reactor would be very attractive if primary emphasis is placed on plutonium production, but a liquid-metal-cooled reactor is more promising as a power producer because it conserves existing supplies of uranium, and appears adaptable to present day steam conditions.

TABLE 1. DESIGN AND OPERATING DATA FOR DUAL-PURPOSE REACTORS

	Water cooled thermal reactor	Sodium cooled fast reactor
POWER		
Total heat, MW	500	500
Gross electric power, MW	106·2	154·6
Net electric power, MW	100·6	145·3
Capacity factor	0·75	0·80
MATERIAL		
Fuel	Natural uranium	U235
Fertile material	—	U238
Diameter of core	13·2 ft	38 in.
Height of core	11 ft	38 in.
Moderator	Heavy water	—
Reflector	Light water	Lead
Shield	Concrete	Concrete
Primary coolant	Light water	Sodium
PRIMARY COOLANT		
Inlet temp., ° F	384	600
Outlet temp., ° F	500	900
Pressure lb/sq in.	1,000	—
MODERATOR		
Inlet temp., ° F	120	—
Outlet temp., ° F	180	—
STEAM CONDITIONS		
Pressure, lb/sq in.	165	485
Temperature, ° F	375	750

TABLE 2. ESTIMATED CAPITAL COSTS OF DUAL-PURPOSE NUCLEAR POWER REACTORS.
Costs in millions of dollars.

	Water cooled thermal reactor	Sodium cooled fast reactor
SITE AND IMPROVEMENTS	2·80	2·80
REACTOR		
Structure	3·25	4·00
Core		
Tank	0·25	0·50
Piping	3·55	2·60
Thermal shield, etc.	0·35	0·90
Blanket	—	2·00
Heavy water	7·00	—
Sodium	—	0·80
Cooling circuit:		
Piping, pumps, etc.	3·55	7·50
Steam generators	2·80	3·50
Auxiliary circuits:		
Pure water	0·80	0·80
Heavy water	0·75	—
Sodium	—	3·00
Helium	—	0·50
Controls	0·85	1·50
Fuel handling	1·20	6·00
TOTAL REACTOR	24·35	33·10
TURBO-GENERATOR, ETC.*	12·65	13·60
STEP-UP FACILITIES	1·20	1·50
TOTAL ESTIMATED CAPITAL COST	41·00	51·00

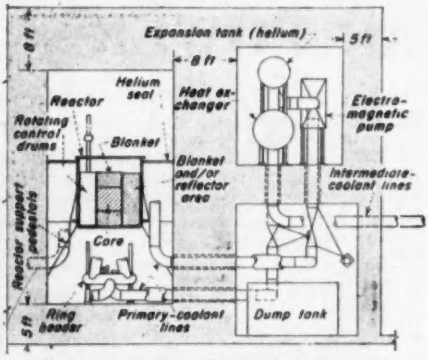
*Water-cooled reactor, 106·2 MW; sodium cooled reactor, 154·6 MW.

Design Data

Design and operating data for the reactors considered are given in Table 1; estimated capital costs in Table 2. More is known about the water-cooled reactor, which would have at its heart an aluminium tank with a number of aluminium tubes between tube sheets containing the moderating heavy water. Pressure tubes for the fuel extend through the core tank concentric to the aluminium tubes. Light (i.e., ordinary) water flows through these pressure tubes. Cooling water velocity needs to be about 15 ft/second for a satisfactory heat transfer rate.

The steam generator would be a four-section heat interchanger, and the turbine a tandem-compound double flow machine.

For the fast type of liquid-metal-cooled reactor would use sodium as a coolant, circulated by electro magnetic pumps. An intermediate liquid sodium circuit conducts the heat to the steam generator. The reactor would be a compact core of highly enriched fissile material, surrounded by a blanket of either depleted or natural uranium in which breeding can take place. The core would consist of a large number of stainless steel fuel elements, while between core and blanket would be a reflector which would provide control.



Section through sodium-cooled reactor

For a liquid-metal-cooled reactor used for power purposes and for the production of plutonium for sale, the total annual operating cost for 154·6 MW output is $1·52m of which $1·055m is attributable to the reactor plant—but this makes no allowance for the cost of fabricating the nuclear fuel into the necessary form. For the water-cooled-reactor the corresponding costs are $1·58m and $1·22m. These prices are based on June 1952 levels.

For such dual purpose plants "profit" would be obtained in terms of the sale of plutonium, electrical energy being reckoned as worth 0·6 c/kWh, the conventional steam-station cost.

A reactor of the sodium-cooled type operated for power only would have an energy cost of about 1·25 c/kWh. For an improved scheme which might become possible when operating experience has been obtained, the cost is estimated at 0·55 c/kWh.

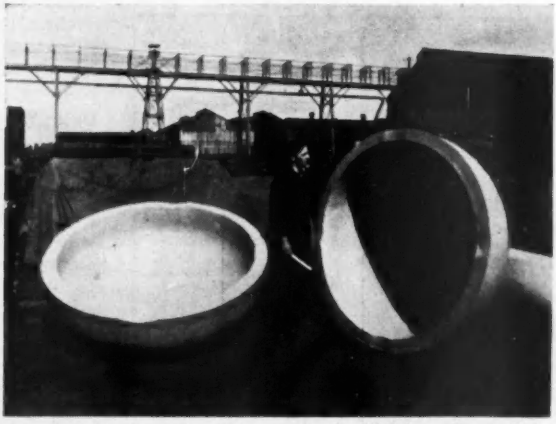
Drumheads for Donington

FORGINGS for the drumheads of the Castle Donington boilers were recently completed at the Renfrew works of Babcock and Wilcox, Ltd. The boilers at this station are of particular interest because of their steam conditions and size. Rated at 830 klb/hr apiece, each of the six boilers ultimately to be installed will generate steam at a working pressure of 1,600 lb/sq in. for supply to 100 MW turbo-alternators. At the turbine stop-valve steam conditions are to be 1,500 lb/sq in., 1,050°F.

The drumhead forgings shown are pressed in three operations from 4 in. thick plates of 34/38 tons tensile steel. Shaped plunger and ring dies are used, the first operation being carried out in a 300-ton press with 8 ft 6 in. column centres. For the second and third operations (sizing and normalising) a 450-ton press with 7 ft 6 in. column centres was used. The finished forgings are 6 ft 2 in. diameter.

When completed, the boiler drums of which these forgings form the end will be 50 ft long, with an internal diameter of 5 ft 6 in. The shells are to be 5¼ in. thick, and the completed drum will weigh 120 tons. Total length of boiler tubing in each unit is at 41½ miles.

Castle Donington station which is situated near Derby in the East Midlands Division.



These 6 ft 2 in. forgings will terminate the 50 ft long drums of the 830 klb/hr boilers to be erected at Castle Donington

PROBLEMS AND PRACTICE in Engineering

Electricity in the Modern Store

THE use of electricity in the modern store or shop is primarily confined to obtaining the best lighting effects, to operate goods and passenger lifts, and provide power for heating, ventilation, etc. This in itself is, of course, the best medium for these services, yet there are many other ways in which electricity can be advantageously employed, particularly in reducing repetitive work and accelerating service to clients. Such an instance occurred recently, during extensive alterations in a four-storey shop to be used as a clothing fashion house.

A modern attendant-operated passenger lift was continuously used to transport customers to the various departments, and to avoid delay a two-way pre-warning signal system was installed. This consisted of a low voltage bell fitted in each department, with bell push controls for each floor, fitted in the lift control panel, so that as each customer entered and stated their destination, the appropriate bell was rung. When the floor was reached an assistant was waiting to give immediate service.

When purchases had been completed, any one of a number of bell pushes fitted on each floor, was used to operate a buzzer and indicator lamp panel installed in the lift. When the push was released the buzzer would stop, but the indicator lamp remained mechanically locked in circuit until the attendant released it on completion of the call. Thus, by the time purchases had been wrapped up, or bills had been paid, the lift was waiting in readiness.

Other irritating delays occurred in location of staff, etc., and a further installation of signal equipment was made. This was again of a low voltage buzzer/indicator lamp type with identical panels in each department, the method being that any indicator lamp cover could be depressed to operate all other similar lamps and a warning buzzer. On releasing the pressure, the buzzer would cease, but all lamps remain in circuit by mechanical locking.

This, in itself, was not entirely minimising unnecessary travel, however, and a private system of intercommunication telephones was installed between departments, in addition to the branch lines from the G.P.O. exchange for outside lines. Now all this may, at first sight, appear to be over-elaboration, but it was satisfactorily proved beyond doubt that fatigue was reduced, service accelerated and turnover increased—surely sufficient return on capital expended.—*J.R.*

Crane Control Circuit Fault

RECENTLY trouble was consistently reported during the turn of night duty of the tripping of an overhead crane protective panel, the control circuit for which was at 50 V, from a transformer in the main supply. Examination of the overload trips, limit switches, traverse collectors, etc., was made, and insulation tests using a "Megger" tester carried out, but no apparent cause could be discovered for the periodic failures which strangely enough only occurred at night, for during the day shifts the crane worked quite normally.

The control circuit voltage was checked during the day time, when, owing to heavier works loads, it could be expected to be low, but a minimum of 48 V seemed to eliminate the possibility of coil under voltage. The crane driver's cab light, fed from the 50 V control transformer was switched on to simulate night conditions, and show if the 60 W lamp made any appreciable volts drop in the control circuit, but this without result until, whilst hoisting a fairly heavy load, the contactor dropped out, not before, however, the test voltmeter was observed to fall from 50 to 30 V. Several more hoists and lowering of the load were made and the failure again occurred intermittently, noticeably when severe vibration took place in the cab. The cab light was switched off and more hoists made without further failure.

To shorten the story, a wire was bare at the back of the lampholder and severe vibration was sufficient to cause a momentary earth fault. The control transformer secondary was centre tapped to earth so that this occasional fault (always at night when the lighting was in use) reduced the contactor coil voltage sufficient to allow the contacts to fall out. When the fault-finding tests had been made the crane was, of course, stationary, and with no vibration there was no fault.—*T.H.S.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Supply in Northern Ireland

RURAL EXTENSIONS WORK SLOWED DOWN

NORTHERN Ireland suffered during 1952 the same recession in industrial activity which affected Great Britain. The results are fully apparent in the Report of the Electricity Board for Northern Ireland, which records an increase in units sold during the year (303,067,000) of only 4·1 per cent compared with the 1951 total. In striking contrast, the 1951/1950 comparison showed an increase of 15·7 per cent. As in Britain, the lack of purchasing power and the fall in the consumption of electricity were most noticeable in those districts largely dependent on the textile industry for employment.

In spite of this setback, however, the Board shows a credit balance on revenue account of £699,481, which compares with £514,876 in 1951. After charging interest and sinking fund contributions, there was a surplus of £1,010, compared with £1,819 in 1951.

Generation and Transmission

As in the previous year, the Board's Ballylumford Station, and the Harbour Power Station of the Belfast Corporation, were run conjointly to give supplies to the Corporation Electricity Department and the Board. A relatively small section of the Board's north-west area was supplied by the power station of the Londonderry Corporation and by the Board's small hydro-electric station at Limavady. During the year, Ballylumford generated 420·5m. units, the maximum load being 115·9 MW, and the load factor on a units generated basis, 41·31 per cent.

The year saw the completion of work on a 110 kV substation at Ballymena, and of erection work on a 110 kV small oil volume c.b. at Drumnakelly. Some 141 miles of e.h.t. line were erected during the year, while the line from Drumnakelly to Omagh, which had been operating at 33 kV since January was in August commissioned at 110 kV. Another important project which reached completion during the year was the Carrickfergus main substation.

Future Development

Following a reference by the Minister of Commerce in November, 1951, the Board recorded their agreement in principle to the publication in due course of schemes for hydro-electric projects on the River Bann at Carnroe and the River Mourne near Sion Mills. Additional borings and surveys necessary to complete site negotiations were still outstanding at the end of the year.

Rural electrification was limited during the year because of restrictions in capital investment and the continuing unremunerative return from existing rural consumers. The Board, having regard to the heavy commitments into which they had entered, decided that sanctions for additional rural extensions should, for the time being, be restricted to those which showed an estimated remunerative return. On this basis, approval was given during the year to additional extensions, estimated to cost £141,189, designed to give supplies to 1,547 rural dwellings and 100 other applicants.

There were 7,983 new consumers connected during 1952, of whom 2,829 were in urban, and 5,154 in rural areas. This increase brought the total of consumers connected at the end of the year to 117,489; 72,337 urban and 41,152 rural. The number of farms connected rose to 6,518, which means that the total has more than doubled in three years. Accent on rural development is given by the percentage increase of the two main classes of consumer during the same period: 15·3% urban, and 51·2% rural.

Public Lighting

Public lighting authorities throughout the Board's area were active during 1952, and among many additions and improvements there were three notable installations. In one case two adjacent lighting authorities changed from low wattage filament lamps to a joint group "A" fluorescent lighting scheme for an important trunk road. In another, a large urban authority changed from filament and gas lamps to a complete fluorescent scheme in both main and side roads, while in the third scheme sodium lighting was adopted for the first time in the Board's area of supply.

The average price per unit sold during 1951 was 1·75d., an increase of about 0·2d. over the value applying from 1948-1951. This has followed from the increased charges which were applied starting with the first billing cycle in 1952. For coal clause purposes, the average price of coal was 69·58/- per ton.

Armouring Large Cables

New Machine embodies all the latest developments

A NEW cable armouring machine has recently been completed and installed at the Chadwell Heath Works of Metropolitan Cables, Ltd., and possesses many features of interest. Although the machine is not new in principle, it is claimed to be the longest of its type at present operating in this country, and is designed to be capable of easy adaption to cover both general and special types of bedding and serving.

The overall length of the machine is some 166 ft. and the main section, which consists of a single carriage, comprises six rings, each carrying twelve bobbins 16 in. in diameter and 11 in. wide. The flyers which carry the bobbins are of the floating type and are maintained in their correct relative orientation by the usual non-concentric ring, lever, and gear system. As can be seen from the above, the capacity of the machine is therefore 72 wires and all standard armouring wires can be handled. Ample space has been left at both sides of the main armouring section to allow for the inclusion of extra serving heads if required for special order.

The drive is from a layshaft running the length of the machine and power is taken to the individual heads by chain drive. Change-gearing is installed in the drive pedestals of the individual sections to permit variations in the lay of the various sections. A 50 h.p. Trislot induction motor, by Horace Green, Keighley, drives this layshaft through a gearbox and a fluid coupling thus ensuring a steady pick-up without excessive overload.

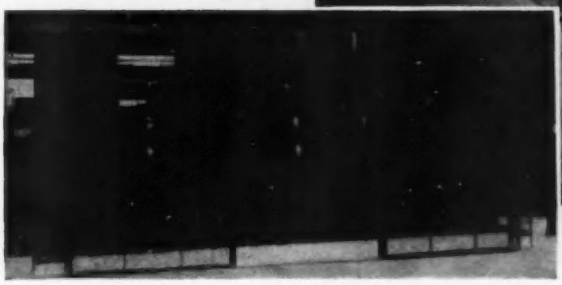
After preliminary serving, the cable passes through a fixed mandrel which carries it through the six bobbin assemblies. This mandrel, of 6 in. bore, is in turn carried by a rotating mandrel of 8 in. bore. The reason for this is to prevent unwanted twists being put in the cable.

Compound is pumped on to the cable from electrically heated pots by valveless reciprocating pumps, which are driven by means of a second layshaft running along the machine. This is powered by an independent 3 h.p. motor. Up to six compound pots can be used.

The haul-off wheel is fitted with a Krupp fleeting ring to keep the cable straight and to prevent crushing of the coils. This wheel is again driven by the main motor through an infinitely-variable speed gearbox.

The final drum take up is by independent drive from a 5 h.p. motor.

The machine was made by Metropolitan Electric Cable and Construction Co., Ltd., and the Trafalgar Engineering Co., and installed by the owning company. It is remarkably silent in operation, and can cope with lay lengths of from 5in. to 34·4 in. and has an average output of 1,000 yds per 8-hour shift.



Above is a view of the machine from the drum take-up end and left are shown the six coges complete with spools

Biscuits for Brazil

New Oven with 275 kW loading installed

BELIEVED to be the largest in Brazil is a biscuit oven which has recently been put into service at the works of Francia Cia, Ltda., Rio de Janeiro. Made by the General Electric Co., the three-tray 275 kW travelling biscuit oven is 7 ft wide and 48 ft long and during an eight-hour working day bakes 5 tons of cream crackers and water biscuits. It was erected on site by the owning company under the supervision of Drake do Brasil, agents for the G.E.C.

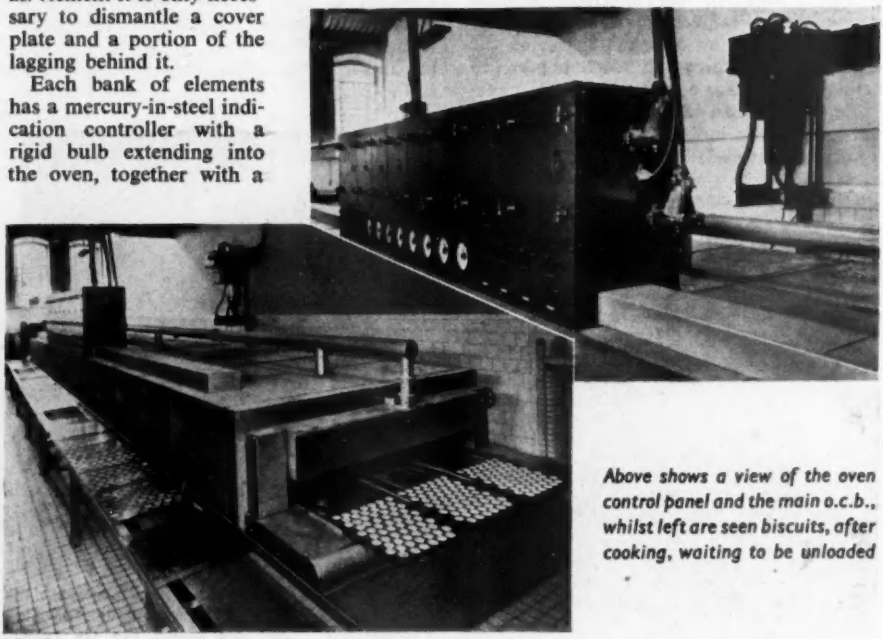
Construction

The oven has eight separately-controlled banks of heating elements extending right across the oven and arranged four above and four below the conveyor. These elements, of coiled Nichrome wire supported in porcelain cleats carried on a bar are easily removable from the side of the oven. To minimise heat losses during maintenance the busbars have been arranged in a chamber on the outside of the oven's inner casing, so that to remove an element it is only necessary to dismantle a cover plate and a portion of the lagging behind it.

Each bank of elements has a mercury-in-steel indication controller with a rigid bulb extending into the oven, together with a suitable relay, pilot lamp and control push-button switch so that any or all of the heated sections can be cut out if required.

Controllers are fitted on the side of the oven near the centres of the sections concerned and the rest of the control equipment is mounted on a central panel above the oven. The temperatures are set at the required level, and thermostats operate air-break contactors in the section circuits. The contactors, with a series of handguard fuses for each section, are mounted in steel plate cubicles carried above the control panel. A separate triple-pole main oil circuit-breaker with a rupturing capacity of 15 MVA at 400 V is fitted with overload protection, a neutral link, an auxiliary switch, no-volt coil and a 6 in. moving iron ammeter and voltmeter.

The conveyor runs straight through the oven, returning under and outside it. Driving gear comprises a 2 h.p. totally-enclosed, squirrel-cage, induction motor driving through variable reduction gears.



Above shows a view of the oven control panel and the main o.c.b., whilst left are seen biscuits, after cooking, waiting to be unloaded

Rationalising Machining

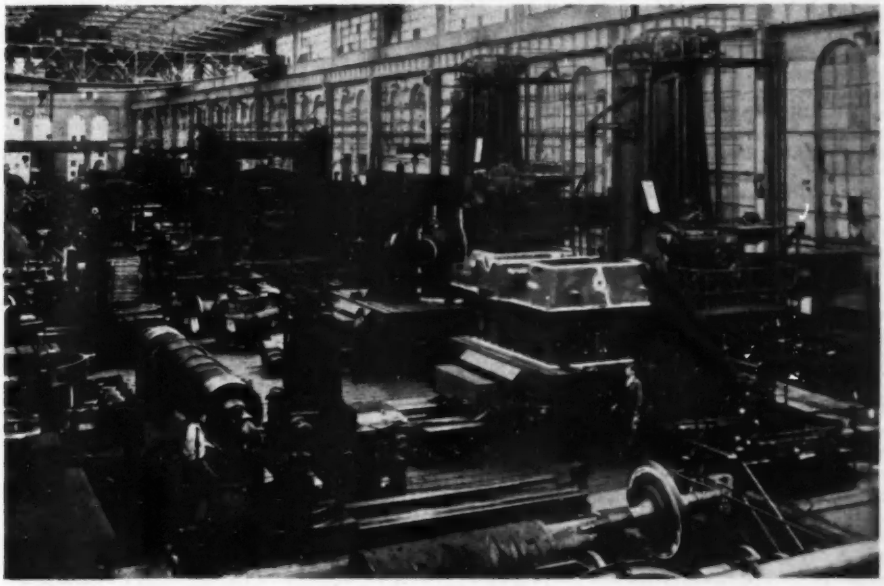
NEW PLANT ARRANGEMENT INCREASES OUTPUT

INVESTIGATION into existing machining methods in the turbine casing works of the British Thomson-Houston Co., Ltd., showed that greater productivity would result if milling were substituted for planing and if the movement of work could be reduced. A decision was then made to instal plant consisting of a large work plate, on three sides of which are disposed horizontal milling, boring and drilling machines, equipped where necessary with rotating and traversing tables. The floor plate is made of 16 sections, accurately fitted and bolted together to form an area 53 ft long and 34 ft wide. The plate is 15¼ in deep and has tee slots, machined from the solid and accurately matched running across the 34 ft width. A special foundation permits access to the solid packing pieces beneath the plate and provides relatively easy means of levelling in the event of foundation settlement. Weight of the plate is 150 tons.

The principal plant consists of two identical Asquith horizontal drilling, boring and milling machines, mounted on a common bed. Each machine is powered by a 40 h.p. motor, the 8 in. dia. spindle having 27 changes of speed. Eighteen milling feeds and nine boring feeds are available at all speeds of the spindle, and in addition nine changes are available at each relative speed of the gear range used. Each column is fitted with rules and verniers for column, slide and spindle traverses. The bed is 62 ft long and permits a maximum distance of 49 ft 7½ in. between the spindles of the two columns. The net weight of the combined plant is 180 tons. Other machines include a horizontal boring and milling machine type HRG, an RG1 horizontal driller, borer and miller, and a heavy duty type XD1 radial drilling machine.

To carry the work to the Duplex machine, two rotating tables with traversing motion are provided, each table weighing some 40 tons and having a maximum capacity of 60 tons. The tables can be positioned and fastened to the work plate as required and can be rotated through 360° by a 25 h.p. motor. A longitudinal motion is also provided by a 20 h.p. motor, and one table has a feed motion, powered by a 5 h.p. motor.

The bedplate with the associated machine tools is shown in this photograph



overseas news

Tower Contract

Because the British Columbia Electric Co. has proposed to place an order valued at $760,000 with the Italian firm, S.A.E., for the construction of transmission line towers for the Bridge River project, the Vancouver Labour Council recently protested. In its rejoinder, the undertaking has pointed out that the only Canadian bid amounted to $1,770,000—it would be utter nonsense for the company to throw away $1,000,000, it was maintained.

Quebec Expansion

The McCormick dam on the Manicougan River was officially inaugurated last week by Quebec's Premier, Mr. M. Duplessis. Started in 1951, for the Manicougan Power Co. the project now has two 45,000 h.p. sets in operation. The development has been designed for an ultimate capacity of 270,000 h.p. Primarily, it will provide reserve power for the pulp and paper industry at Baie Comeau. It has been estimated that the full development of the Manicougan River by a series of dams could provide about 2,000,000 h.p.

Work in B.C.

Preliminary work has started on the construction of the Spillimacheen hydro-electric development by the British Columbia Power Commission. The job involves an intake dam and a tunnel 3,800 ft long, 7 ft dia. The project will have three generators, two of 1,350 h.p. each and a third unit of 3,000 h.p., making a total of 5,700 h.p. A 33 kV transmission line will run to Golden and to the Lake Windermere power district. When this line is in service the existing diesel generating plants at Golden and Athalmer will be shut down. The hydro project is expected to be completed within two years. The tender for the civil construction work is expected to be placed very shortly.

U.S.-Canada Link?

The U.S. Congress has been asked to approve legislation to clear the way for a proposed link-up of the Michigan and Ontario electric power networks. The proposal was put forward on behalf of the Detroit Edison Co. The legislation would allow a utility operating solely within a state's boundary to sell power to a foreign country without being brought under jurisdiction of the Federal Power Commission. The Senate commerce committee has approved similar legislation. At the Congress meeting it was stated that the proposed link-up of Ontario hydro power with Michigan steam generating plants could not go ahead without the legislation because of opposition of Michigan concerns to F.P.C. control.

Another Brazilian Project

A loan of $7,800,000 for electric power development in the State of Minas Gerais in Brazil, has been approved by the International Bank for Reconstruction and Development. The output is intended primarily for the manufacturing and mining industries in the State. The joint borrowers are the Centrais Electricas de Minas Gerais and one of its subsidiaries, Companhia de Electricidade do Alta. The project includes the construction of a dam across the Rio Grande River at Itutinga Falls, a power station with two 12,000 kW sets, and the erection of 130 km of transmission lines, etc. Cost of the project is estimated at $16 million, of which the Bank's loan will pay the foreign exchange costs.

Mexican Scheme

Construction of the President Aleman Dam on the River Tonto, Mexico, is nearing completion. This dam is only one phase of a major project to transform the Papaloapam River valley into a food growing area, a source of power to industrialise the south-east and a major factor in Mexico's growing economy. In the next phase of the work, scheduled for completion by 1955, a hydro-electric plant capable of generating 650 million units annually, is to be built at the site of the dam. It is stated that the generators and turbines are being supplied by Brown, Boveri, of Switzerland. Power will be transmitted to Mexico city, 300 miles to the north-west, and to port cities in Vera Cruz.

Lines for Turkey

The erection of overhead transmission lines in western and north-western Anatolia is provided for under a contract just placed by Turkey with the Italian concern S.A. Italiana d'Elettrificazione. Cost of the scheme is estimated at T£60 million. The lines are to inter-link cities such as Ankara, Manissa, Izmir, Kutahya, and Balikesir. The work is expected to be completed within three years.

Japanese Infiltration?

A report on the merits of Japanese lead sheathed telephone cable has just been released in New Delhi by the Japanese Cable Investigation Committee. That Committee was set up in September last with Mr. B. Das, M.P., as its head, to inquire into the merits of a transaction

relating to the purchase of 687 miles of p.i. armoured underground telephone cables of Japanese origin from a firm in India at a cost of Rs. 82 lakhs. The Committee visited Calcutta, Bombay, Madras and Hyderabad and obtained samples of Japanese cables dug up for them. Similar sample lengths were obtained from various places in India together with samples of British cables laid underground. The opinion has been expressed by the Committee that the construction of the Japanese cables conformed to the standards accepted in telephone cable manufacture by firms in Britain and elsewhere. Samples were also tested by the National Physical Laboratory, who subsequently stated that the Japanese cables stood the tests fairly satisfactorily, and that they had no apprehension that the cables would not last their normal life. In regard to the proposed contract, the Japanese manufacturers have apparently guaranteed to replace the cables in the event of their failing within the normal life period—about 35 years. But there is also the suggestion that Japanese manufacturers should be given the same consideration as is extended to other firms in overseas countries.

Hydraulics Laboratory

India's largest hydraulic engineering laboratory was officially inaugurated recently by Mysore's chief minister, Mr. Harumanthiah, at the Power Engineering Department of the Indian Institute of Science, at Bangalore. The laboratory will provide advanced training in hydraulic machines and pumps and in water turbines. Built at a cost of Rs. 12 lakhs, on a three-acre plot, the two-storeyed laboratory is the last of 16 constructed by the Institute.

Line Work

Work on the construction of the 200 miles of 220 kV transmission line from Nangal and Bakra power stations to Delhi is now proceeding apace. The concrete foundations for 1,068 towers between Delhi and Nangal have been completed and the towers themselves are now being erected. Scheduled for completion about the middle of 1954, the work is being carried out by engineers of the Public Works Department, Electricity Branch, Punjab.

New Escom Station

The Vierfontonein power station of the Electricity Supply Commission of South Africa is now in operation, the first 30 MW turbo-alternator having gone on load recently. The station is ultimately to have ten such sets and 17 210 klb/hr boilers. Constructed on a coalfield about eight miles south of the Vaal River, the station is primarily intended to assist in meeting the heavy demand expected from the Orange Free State goldfields. Coal is transported by conveyor belt from a 12,000 ton staith direct to the boilers. The station is being connected with others in the Vereeniging area by a 132 kV line.

Inauguration

The new generating station at Townsville for the State Electricity Commission of Queensland was formally opened by the State Minister for Mines, Mr. Riordan, last Saturday. The station, which is to have an installed capacity of 52,500 kW, has been erected on a mangrove swamp reclaimed by the Townsville Regional Electricity Board. Its foundation consists of 1,350 timber piles and a concrete raft to ensure complete stability. Most of the plant is of British manufacture.

Atom Power Hopes

South Australia's next power station, which will be needed about 1960, will be operated by atomic energy. That is the view of Mr. Playford, the State Premier, who has just returned to Adelaide after a tour in which he inspected atomic energy research stations in Britain and the United States. It will be recalled that uranium resources in South Australia are now being developed. Mr. Playford believes that out of the tremendous development in the peace-time use of atomic power both in Britain and the U.S., more advanced and efficient atomic piles will be evolved which will provide electric power cheaper than from existing fuels. The Electricity Trust of South Australia already has under construction a steam power station at Port Augusta, and a duplicate station there is planned.

Cutting Cable Prices

The prices of British-made electric cable were the subject of discussion at this month's meeting of Melbourne City Council, when a councillor, Sir Frank Beaurepaire, alleged that English firms were offering cheap cables to Australian public authorities to stop the growth of the cable-making industry in Australia. The meeting was discussing a statement from the Electric Supply Committee on prices of cable for the Spencer Street power station. According to the statement, 10 tenders were received in 1951 for the supply of p.i.l.c. cables, but none was accepted because the makers would not accept the Council's terms and insisted that the whole of the supplies should be bought immediately. The committee then decided to place orders from time to time during the next three years up to a value of £146,000. An order for cable valued at £31,248 was placed with one English firm in October 1951, and last May a £48,670 order was given to another concern, the lowest of the original tenderers, at prices approximately 30% lower than the price originally quoted. Last month that company reduced its quotation by another 30% on a further order of £74,000. Sir Frank Beaurepaire, who founded the Olympic Cable Co. in Australia, said that at present no local concern was producing the type of cable required by the council, but by the end of this year three firms would be marketing it. In his view the prices quoted were so low that it looked as if they had been engineered to make it difficult for Australian companies to enter the market.

PERSONALITIES

IN THE INDUSTRY

The British Central Electrical Co., Ltd., announce that **Mr. G. J. Pluckrose** has just joined the company as assistant to general manager, having recently left the British Thomson-Houston Co., Ltd., Rugby.

During the 6th Triennial Congress at Stockholm earlier this month **Dame Caroline Haslett,** D.B.E., J.P., was unanimously elected for a further 3-year term of office as President of the International Federation of Business and Professional Women.

The Marconi International Marine Communication Co., Ltd., announces a change in the management of its Hull and Grimsby depots, occasioned by the retirement of **Mr. J. R. Thomson,** who has been at Hull since 1942. **Mr. F. W. J. Grinter,** who has been in charge of the Grimsby depot for the past year, will be the new manager at Hull in succession to Mr. Thomson, but will also remain responsible for Grimsby depot pending the appointment of a new manager for duty there.

The appointment of **Mr. C. W. A. Priest,** B.SC.(ENG.), A.M.I.MECH.E., M.I.E.E., as chief generation engineer (construction) in the South Wales Division of the B.E.A. we briefly reported exclusively last week. We are now able to reproduce his photograph. Mr. Priest has had extensive experience in power station work. Since 1948 he has been generation engineer (construction) with the Southern Division of the B.E.A., and earlier he was deputy general manager and engineer to the Battersea Borough Council for about 10 years during which time he was concerned with extensions to the Lombard Road power station. From 1936 to 1939 he was turbine room operating superintendent at the new Fulham power station, but between 1923 and 1936 he had been associated with the installation of alternators, boiler and auxiliary plant at the Deptford East Power station initially with the London Electric Supply Corporation Ltd., and then with the London Power Co. when that concern took over the station. For the last four years at Deptford he was deputy to the chief assistant engineer and control engineer there. Much of his earlier experience was gained at the Dick Kerr works of the English Electric Co., Ltd. where he was engaged in experimenting on new designs of traction motors and rotaries, and he also did much work on steam turbine plant.

Mr. C. W. A. Priest

As from August 1, **Mr. J. Y. Broughton** takes over his new duties as group I generation engineer (operation) for the London Division of the B.E.A., succeeding in that position **Mr. R. S. Atkinson,** A.M.I.MECH.E., A.M.I.E.E., who is now chief generation engineer (operation) for the Merseyside and North Wales Division of the Authority. Since December, 1950, Mr. Broughton has been station superintendent at Fulham generating station, London Division; before that he was assistant station superintendent there. In fact, he has served at Fulham for the past 27 years, during the course of which he has held various posts.

Mr. J. Y. Broughton

The triennial award of the Coopers Hill War Memorial Prize and Medal has been made by the Council of The Institution of Electrical Engineers to **Mr. G. Lyon,** M.SC.(ENG.), A.M.I.E.E., for his paper on "Some Experience with a British a.c. Network Analyser."

Mr. C. R. Bates, A.M.I.E.E., has given up his practice as a general industrial and electronic consultant in order to specialise in electronic welding controls. He has become a director of Bates and Bates, Ltd., of 73 Ashville Avenue, Birmingham 34, who are manufacturing synchronous controls to his designs and patents, we understand.

Our good friend **Mr. Victor W. Dale,** general manager and secretary of the Electrical Development Association, entered a nursing home last Thursday. We trust he will soon be back at his normal duties.

Mr. F. W. Baker has resigned the chairmanship of the Ransome & Marles Bearing Co., Ltd., but remains a member of the board. **Mr. E. W. Senior,** a director of the company, has been appointed chairman.

Mr. R. F. Long, senior publicity assistant, Enfield Cables Ltd., has passed the Final Examinations of the Advertising Association, and is now a Diploma Member of the Association.

Mr. W. C. Handley has resigned his directorship of Thomas Bolton & Sons, Ltd. **Mr. G. J. Poole** has been appointed in his stead.

Mr. D. M. Stephens has been appointed president and general manager of the Winnipeg Electric Co. in succession to **Mr. W. H. Carter** who is now chairman of the Greater Winnipeg Transit Commission.

In view of the recent serious disturbances in Calcutta, following the decision to raise second class fares on the trams in the city, **Mr. D. E. Webb,** chairman of Calcutta Tramways Co., Ltd., has this week arrived in Calcutta by air for discussions with the West Bengal Government.

Following the recent decision of the English Electric Co. (South Africa) (Pty.), Ltd., to set up branch offices in Cape Town, Port Elizabeth and Durban, branch managers have been appointed from the company's Johannesburg staff. Manager of the Cape Town branch is **Mr. G. V. Jackson,** who has for many years specialised in fusegear work for the company. At Durban, **Mr. W. G. H. Jarvis,** who has been a member of the senior sales staff, is the branch manager. **Mr. G. L. Jessop,** who becomes branch manager at Port Elizabeth, has latterly been in charge of the department dealing with sales of Benoni Works products. In addition, **Mr. A. E. O'Dowd,** sales manager at the Johannesburg office, has been appointed technical representative for the Rhodesias and Nyasaland.

Mr. B. I. Nealon has joined the Thermovent Heating Division of E. K. Cole, Ltd., as technical sales representative. Operating from the Company's Birmingham depot, he is covering the Midland counties.

Mr. B. I. Nealon

Mr. John Ayres, at present managing director of Petters, Ltd., is being released from his service agreements with the Brush group, to enable him to take up the appointment of general manager and director of Simms Motor Units, Ltd., on October 1 next. The Brush Board has announced that their colleague, **Captain R. C. Petter,** will as from that date be appointed managing director of Petters, Ltd. Captain Petter, who is a member of the Brush board, has agreed to assume those responsibilities on a temporary basis until it is possible for the board to make a permanent appointment.

Mr. H. A. Springer has been appointed an additional director of Sangamo Weston Ltd., and **Mr. B. Epstein** is now secretary of the company in place of **Mr. F. R. Butherus,** who continues to be a director.

From Hirst, Ibbetson and Taylor Ltd., we learn that **Mr. J. T. Grimshaw** is making a steady recovery from his recent illness and it is hoped that he will be able to resume his duties in August. He will not, however, be able to cover so extensive an area as hitherto, and it has therefore been agreed that he should relinquish the southern part of his original territory. To represent them in South Cheshire, the company has appointed **Mr. F. L. Platt,** of 215 Congleton Road, Butt Lane, Talke, Stoke-on-Trent.

Mr. K. P. Wood, M.A.(cantab.) has resigned from the board of James Beresford and Son Ltd., and has now severed his connection with that company which he joined as sales manager in 1933, subsequently being elected to the board in 1945. He gained earlier experience with Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, Belliss and Morcom Ltd. and Lancashire Dynamo and Crypto Ltd., with which latter firm he subsequently held a position in the sales organisation. He is the eldest surviving son of the late Mr. A. P. Wood who was the founder and first managing director of the Lancashire Dynamo and Motor Co., Ltd.

Mr. F. Lloyd-Kessel, chairman and managing director of Lloyds Engineering Companies, Ltd., is leaving at the end of this month for a continental tour, visiting Belgium, Luxembourg, France, Switzerland, Austria and Germany. This tour has been arranged with particular reference to their associated company, H. Fisher (Oldham) Ltd., in order to study the effects of foreign competition against British products on the domestic appliances markets in other countries. Mr. Lloyd-Kessel is also visiting a number of well-known industrialists in Germany at their invitation to discuss possible co-operation with regard to marketing and manufacturing in Germany under British licence. It is anticipated that a similar tour will soon be made covering the whole of Scandinavia where Fishers of Oldham are holding some very considerable interests.

Formerly business manager and technical adviser of the Oldfield Engineering Co., Ltd., **Mr. G. W. Kovach** has been appointed managing director of Whitefield Machinery & Plant, Ltd.

Dr. B. V. Bowden, M.A., PH.D., A.M.I.E.E., a radar expert who has been with Ferranti, Ltd., for the past three years, is to be the new Principal of the Manchester College of Technology and Dean of the Faculty of Technology in the University of Manchester.

At present deputy chief engineering inspector, Electricity Division of the Ministry of Fuel and Power, **Mr. H. W. Grimmitt,** M.I.E.E., A.M.I.Mech.E., has been promoted to chief engineering inspector as from September 1. He succeeds **Mr. Alan N. East,** C.B.E., M.I.E.E., M.I.Mech.E., Assoc.Inst. C.E., whose impending retirement we have already noted. Mr. Grimmitt has held his present position since the dissolution of the Electricity Commissioners in September, 1948—he had served with the latter organisation since 1930.

Mr. H. W. Grimmitt

OBITUARY

Capt. Sylvester Slattery, consulting engineer to the British Electrical and Manufacturing Co., Ltd., has died at Sunderland. At one time he was electrical manager for the former Sunderland Shipbuilding Co.

Mr. Philip B. Vaughan, one-time director of the Vaughan Crane Co., Ltd., died at Bristol on July 21, aged 53. He was a nephew of the founder of that concern.

Mr. W. A. Gilbert, A.M.I.E.E., formerly mains superintendent to the West Ham Corporation Electricity Department, died on July 24.

Dr. G. L. Kelley, deputy chairman of the Pressed Steel Co., died on July 25, aged 73.

Mr. W. J. Terry, chairman and managing director of London Electric Wire Co. and Smiths Ltd., died on Monday, July 27. He was also managing director of the Liverpool Electric Cable Co., and a director of the Vactite Wire Co.

Mr. James J. Fraser, who was managing director of Honeywell-Brown, Ltd., died on July 17, aged 51. A Scot, he graduated from Edinburgh and spent some of his early years in South Africa. In 1928 he joined the Minneapolis-Honeywell organisation in Canada, where he became manager of the Montreal office. When, in 1936, it was decided to form the British Company of Honeywell-Brown, Ltd., Mr. Fraser was chosen for that work. As managing director since its inception he has been directly responsible for its growth and development in the instrument industry over the years.

Mr. James J. Fraser

NEW LITERATURE

Electricity Supply Engineering

Ed. by E. Molloy

IN spite of its all-embracing title, this volume concerns itself exclusively with distribution, after an introductory chapter has sketched the history and organisation of this country's supply undertakings. In dealing with distribution, it gives a useful if rather elementary survey of underground and overhead systems as a whole, and a rather more detailed description of cable laying and jointing at distribution voltages.

The two chapters which end the book stand rather apart from the others. They give a helpful non-mathematical description of current techniques of remote supervisory control of substations and of remote control of consumers' apparatus. Taken as a whole, this volume should serve as a useful introduction to practice for young engineers embarking on area board work. Published by Newnes, 164 pages, 9 in. by 6 in. Price 17s. 6d.

Garcke's Manual of Electricity Supply

THIS 1952-53 edition is the fiftieth volume—truly a remarkable record, in the achievement of which all concerned are to be congratulated. Maybe the originator, the late Emile Garcke, could not foresee the immense advance of the supply industry and of his "bible," but we feel sure he would not be other than pleased at the present substantial size of the volume and its contents. In the arrangement of the material included there has been no noticeable change from last year's edition, but complete revision has, of course, been carried out. There is a statistical review of the B.E.A. and of the North of Scotland Hydro-Electric Board followed by particulars relating to the Divisions and the Area Boards, the latter information being broken down to district level. The section relating to companies lists much of the financial detail, and there is the usual directory of personnel to complete this very useful volume. Published by Electrical Press, Ltd. £3 17s. 6d.

Radio Designers Handbook

by F. Langford Smith

SINCE this important volume was first published in Australia and distributed in this country in 1940, it has increased steadily in popularity. Now it is more than four times as large as its previous edition and is more comprehensive than ever. Its appeal is wide because it is directed not only to the designer, but also to user and the amateur in the wireless and reproduction field. Practically every possible question on design and application can be answered by reference to this volume—and the answer will be clear, concise and accurate. Fourth Edition, distributed in Great Britain for the Wireless World, Iliffe and Sons, 1,482 pp, 5½ in. by 8¼ in. Price 42s.

Industrial Brazing

by H. R. Brooker and E. V. Beatson

ENDEAVOURING to serve both practising engineers and those studying this subject, the authors have produced a treatise which is both extensive and intensive. Its treatment of each aspect of the wide field covered by the heading is such to make for separate parts, for simplicity of

reference, whilst preserving continuity to enable the book to be read straightforwardly from cover to cover without undue repetition. The reader is plunged into the practical details of brazing from the start, in a brief discussion of origins and principles of brazing, which precedes a complete survey of heating methods and equipment—with the exceptions for aluminium, stainless steels and other materials requiring specialised techniques. Brazing materials receive due attention from the viewpoints of both character and most useful applications, which leads naturally to a consideration of joint design and strength. Various methods of brazing—torch, furnace, electric induction and resistance, and dip—are then examined in considerably greater detail before turning to more specialised processes. Its final chapter discusses problems of selecting brazing processes for given types of work and makes a useful contribution on inspection and testing. Published by Iliffe and Sons, 344 pp., 8¼ in. by 5¼ in. Price 35s.

Radio Upkeep and Repairs

by A. T. Witts, A.M.I.E.E.

FOR the seventh edition of this useful little book for radio service engineers the author has deleted three chapters appearing in the previous edition, expanding the subject-matter concerned with principles of radio servicing and adding a new chapter on the use of an ohmmeter and signal generator. The alterations have preserved in the book its essential feature of being a practical work entirely devoid of theory, one which few engineers dealing with radio receiver repairs or maintenance would regret having to hand. From its opening chapter on the construction and use of test equipment to its conclusion the emphasis on the practice of the subject is maintained at a high standard. The first four chapters are introductory in character, discussing initially, as mentioned earlier, test equipment, following which aerials and earths receive close attention, leading to an extensive consideration of the general principles involved in servicing. The use of an ohmmeter and signal generator concludes this section, the next chapter being concerned with examination of the faults most commonly met in servicing, and their correction, leading to a more intensive discussion of mains supply equipment. Accumulators are dealt with briefly, followed by useful information on the fitting, use and service of gramophone record playing equipment, a chapter on quality reproduction in general closing the book. Seventh edition, published by Pitman, 220 pp., 7¼ in. by 5 in. Price 12s. 6d.

Illumination Engineering

by W. B. Boast, Ph.D.

IN its general plan, this second edition is little different from the first, although much has been re-written or reviewed in the light of developments in the last decade. New chapters—on colour, the inter-reflection design method, ultra-violet and infra-red light sources and applications among others—have been added to increase the scope of a book, which despite its American character has much of value for the electrical engineering student. As in the first edition this work contains no illustrations of lighting systems, but tables of lamp data and other information have been added, for example, and problem purposes. Terms and general principles of illumination are discussed in the opening chapters, leading to a thorough consideration of measurement. Absorption, reflection and transmission of light are then dealt with, followed by a survey of electric light sources and their characteristics. Illumination standards and the design of interior lighting systems by both lumen and inter-reflection methods receive careful consideration, as are luminous architectural elements, whilst testing and colour specifications are covered fully. Outdoor lighting is discussed, together with chapters on u.v. and infra-red light and wiring to conclude the book. Second edition, published by McGraw-Hill 340 pp., 9 in. by 6 in. Price 59s. 6d.

BOOKS RECEIVED

Practical Thermometry, by J. A. Hall. Monograph for general reading by students, considering modifications to instruments for industrial applications. Published in the Monographs for Students series by the Institute of Physics, 52 pages, size 7¼ in. by 4¾ in. Price 5s.

Newnes Electrical Pocket Book, edited by E. Molloy, includes new sections on atomic energy, u.v. lamps, radiant heat drying and cold pressure butt welding. Twelfth edition. Published by Newnes, 391 pages, 6¼ in. by 4 in. Price 8s. 6d.

Electric Control Systems, by R. W. Jones. Text book for senior electrical engineering students. Third edition, published by Chapman and Hall, 511 pages, 9 in. by 5¾ in. Price 62s.

Copper and Brass Pressings. Revised edition of C.D.A. publication No. 26 and deals with pressings and other products cold formed from strip and sheet. Published by the Copper Development Association, Kendals Hall, Radlett, Herts, 81 pages, 8¼ in. by 6 in. Gratis.

Small Motors and Transformers, edited by E. Molloy, intended for engineers undertaking design construction or rewinding of such machinery. Published by Newnes, 176 pages, 8¼ in. by 5¼ in. Price 15s.

Electric Resistance Heating. Fifth in the Electricity and Productivity series published by E.D.A., discussing theory of electric resistance heating, types of elements and describing types of equipment. Published by British Electrical Development Association, 2 Savoy Hill, W.C.2, 182 pages, 8¾ in. by 4¾ in. Price 8s. 6d. (9s. post free).

The Instrument Manual, edited by J. T. Miller. Revised edition, includes new sections on eight subjects whilst five others have been rewritten. Published by United Trade Press Ltd., 9 Gough Square, Fleet Street, E.C.4, 105 pages, 11 in. by 8¼ in. Price 4 gns.

TORONTO's TALL TASK

Placing the multiplicity of Wires and Cables Underground

THE removal of all overhead lines from the main streets of Toronto, Ontario, has been the theme of local suggestions for some years now. It seems that agitation is usually renewed after visitors from the Province have been to Britain during the course of which they have noted the English towns' relative freedom from poles and their maze of wires such as are a common sight in parts of Toronto. A typical example of the latter is shown in our accompanying illustration.

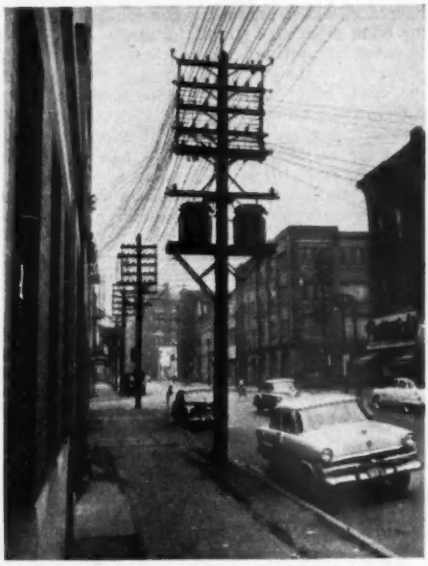
It should be made clear that the Toronto Hydro Electric System is not the only culprit in this matter. Overhead wires have also been erected by the Toronto Transport Commission, the Bell Telephone Co., two telegraph companies and various fire alarm concerns which operate in the city.

Actually, the Toronto Hydro Electric System started, in 1949, a long term programme to eliminate the overhead lines from the city's streets, but some idea of the enormity of the task may be gained from the fact that it is estimated it would cost $250 million to place all the undertakings' mains underground.

For the 200 miles of main city streets alone the cost is put at $50 millions.

An Opportunity

Here surely is a project for which the British manufacturers, with their long experience of such equipment, should be able to find a steady market. True, a wariness in expending capital on such a non-revenue producing scheme is holding up any likelihood of an all-out attack on the task, and it seems from present indications that the work may be spread over something like fifty years. Nevertheless, it provides an opportunity for export trade for which British firms are admirably fitted.



A typical Toronto scene—near Richmond Street

The present policy of the Toronto Metropolitan Council provides that for new streets, or street extensions, all cabling must be underground, and it is now being suggested that a similar policy should be adopted for roads within the Metropolitan area.

A Small Start

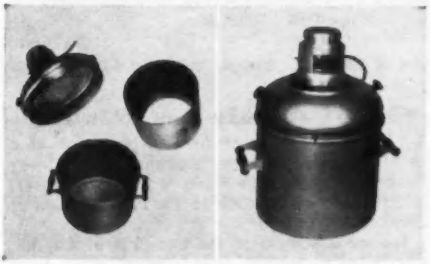
Taking advantage of road widening schemes, the Toronto Hydro Electric System last year placed underground 425,000 ft of cable on streets where poles had to be moved. In addition, about 24,000 ft of underground ducting was provided for use when the removal of overhead cabling is resumed. But the Hydro Electric Commissioners state that further removal of overhead wires will have to wait until necessary plant improvements have been made and facilities for the frequency standardisation programme provided. As far as the Bell Telephone Co. is concerned, some 85 per cent of its 1½ million miles of wires are already underground. This company, by the way, also has an agreement with the Toronto Hydro System which allows the wires of both concerns to be strung from the same pole. Elimination of the trolley bus overhead wires along 235 miles of city roads of the Toronto Transport Commission is, of course, out of the question, apart from where more subway lines are constructed.

The BUYER'S *Column*

New Portable Washing Machine

SOON available is a new type washing machine which, costing only £25 (tax paid), washes 3 lb of clothing by a gentle turbulation of the washing water induced by a suction impeller fan housed in the upper section.

This new "Wavemaster" machine, distributed



Three main sections comprise the "Wavemaster" machine

by E. J. BOWMAN (LONDON), LTD., 58 Paddington Street, London W.1, comprises a six-gallon aluminium outer container which can be used for boiling water, an inner cylinder which keeps the clothes away from the side and allows air currents to circulate and the motor compartment housed in a lift-off lid.

The 375-W motor drives a suction fan in the top compartment which causes currents of air to bubble through the washing in the lower container.

Light in weight the "Wavemaster" can easily be stowed away. We understand that dishwashing crockery containers will soon be available to convert the "Wavemaster" into yet another labour-saving device.

Aid to Mass Production

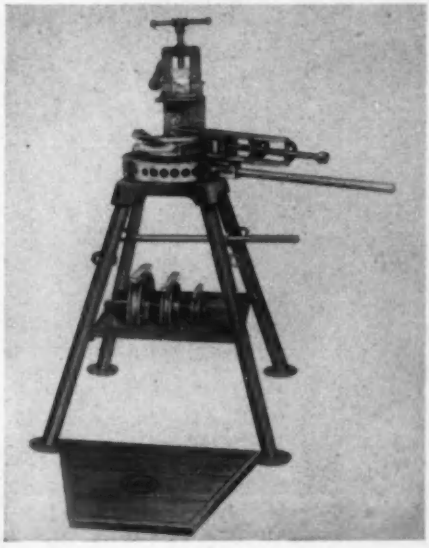
AN ingenious component holding tray assembly for small parts required for assembly work has recently been marketed by the BRITISH CENTRAL ELECTRICAL CO., LTD., of 6-8 Rosebery Avenue, London E.C.1. Known as the "Visipart," this assembly consists of two aluminium pillars rigidly fixed to a solid wooden base. Pivoted on these pillars are ten trays made of transparent plastic, each tray being sectionable into two compartments by a removable partition. Thus a range of 20 to 40 compartments is available. The space occupied on a bench is small, only 9½ in. by 6¼ in. for the base and 15 in. for the height. Complete and ready for use, the unit costs £3 10s.

These Visipart trays help mass production

Bending Conduit

THE problem of bending conduit on site is greatly eased by the LACO Easi-bend universal bending machine. For the plumber this machine will cope with copper tube to B.S.S. 659/44 from ½ in. to 2 in. dia, while for the electrician the range is ¾ in. to 2 in. dia. As far as the plumber is concerned, the machine is sold as the Model LE.500, while the electrician's equivalent is Model LE.550. Net weight of the machine is 114 lb and together with stand LE.575 it weighs 264 lb. If the Laco vice is required the overall weight is extended to 272½ lb. The machine is produced by LAWLER AYERS AND CO., LTD., 54 Old Broad Street, London E.C.2.

The Easi-bend handles tubing ¾in.—2in. diameter. This model is the LE550 designed for electrical work



Ekco's 15in. Table T.V.

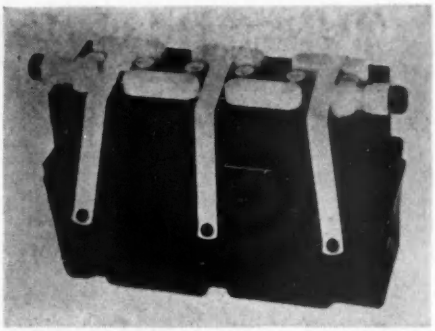
SUCCEEDING the popular T164 table model is a new Ekco 15 in. tube set T207 which incorporates full automatic control of picture and sound. The aluminised tube gives a picture of 13½ in. by 10 in. and the tube is protected by a dust-sealed mask and protective screen.

Automatic sound and vision interference limiting and EKCOVISION spot-wobble are also included. The chassis is based on the highly successful "triple-link" design which has proved so reliable. The price of this set is 76 guineas inclusive of P.T.

Boiling for Caterers

DESIGNED for arduous service under the most exacting conditions is the EUK electrical boiling pan which utilises immersion heaters in the jacket and can, if required, be thermostatically controlled. The pan itself is of heavy gauge polished stainless steel with an integral hob fitted with a water lute, all welding being carried out by the Argon-arc process with seams ground and polished. The jacket is of all-welded construction. The loadings are 10 gall (13·3 gall brim capacity), 7·5 kW; 20 gall (27 gall brim capacity), 10·5 kW; 30 gall (37 gall brim capacity), 15 kW, and 50 gall (59 gall brim capacity), 21 kW. The pans are made by EUK CATERING MACHINERY, LTD., Wellington Street, Oldham, Lancs.

These EUK caterers boilers are designed for arduous service



One of the P.V.C. troughs made by Creators Ltd.

Battery Troughs in P.V.C.

WE have illustrated on this page one of a batch of battery troughs supplied by CREATORS, LTD., New Haw, Weybridge, Surrey, to S.B.A.C. specification to the Percival Aircraft Company.

The measurement of the trough is as follows: length, 16½ in. by 5 in. deep by 6½ in. wide. Each trough is supplied complete with four ebonite studs, three p.v.c. retaining straps and six absorbent strappings.

Simplex re-name "Restaurant" range

THE Simplex Restaurant Range (Model HC.2899) has now been re-named the "6-16-60 Range," say SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs.

The Creda 6-16-60 Range, which has been installed in small hotels, boarding houses, restaurants, cafes, clubs and large private houses, incorporates large and small ovens, both thermostatically controlled, a spacious griller which has two stage heat control—this allows for half the grilling area only being employed when the demand is small—a separate plate warming drawer and five boiling plates—four 8 in. and one 6½ in. all controlled by Simmerstat.

The Creda 6-16-60 Range is finished either in two-tone ivory or silver grey mottled vitreous enamel and the interior is blue mottled vitreous enamel.

The two-tone ivory model costs £112 10s. and the silver grey model £109 10s.

Compact Miniature C.B.s

A REQUIREMENT frequently arises for miniature circuit-breakers which will afford protection for small current-consuming plant such as f.h.p. motors, wireless and television sets, small transformers, instruments and other types of electrical apparatus. Hitherto, two factors have militated against the use of existing types of breakers for these purposes. The first is that of space, and the second is the difficulty of obtaining

reliable operation at the low overload currents concerned. A new range of breakers, however, handled by HILBERT AND CATT, LTD., 20-28 High Holborn, E.C.1, are exceedingly compact and are claimed to provide consistent and reliable operation. These are the E-T-A range of single-pole thermally - operated circuit-breakers and the E.L.P.O. range. The first of these has current ratings from 0·1 amp up to 25 amps at 250 V a.c. and the second are rated at 30 amps at 250 V a.c. In the first series, however, due to their low ratings, it is recommended that they be backed up with h.r.c. fuses not exceeding twice the rated current of the breakers. The second, however, can interrupt a prospective current of 3,000 amps in one half cycle.

TRADE PUBLICATIONS

PHOTO-ELECTRIC EQUIPMENT.—Bunker and hopper control using photo-electric equipment is featured in a new leaflet by Radiovisor Parent, Ltd., 1 Stanhope St., N.W.1.

LIGHTING.—"Lighting the Way" is the story of the Benjamin Electric Ltd., makers of lighting fittings, of Brentwood Road, Tottenham, N.17. It sets out the history of the company and shows something of the plant and research facilities available.

PLASTICS.—Vibak rigid sheet and its application are described in a new booklet issued by Bakelite, Ltd., 12-18 Grosvenor Gardens, S.W.1.

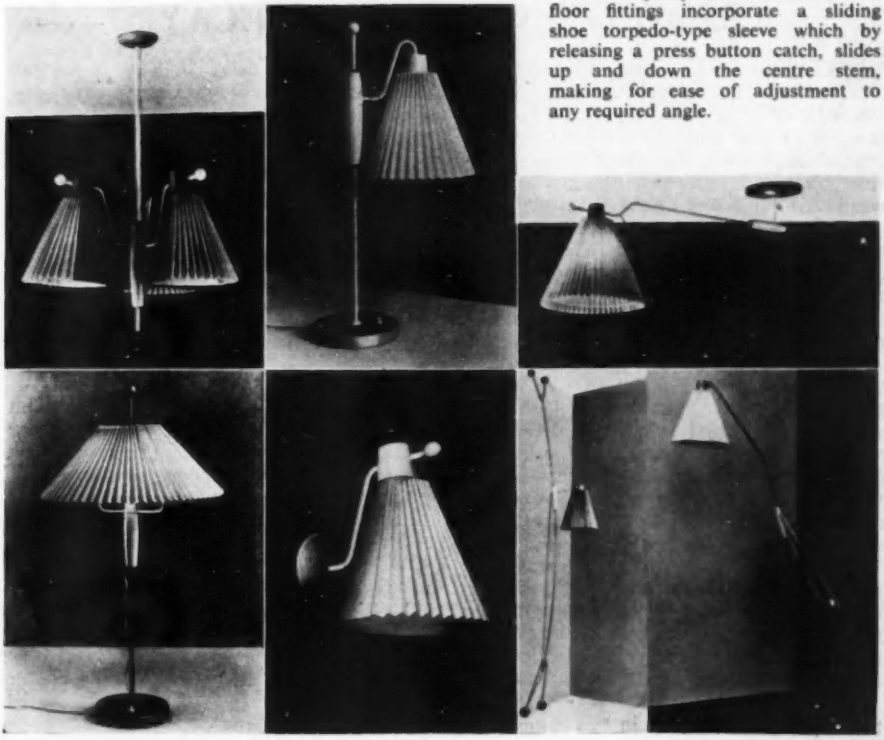
The New Allom Range of Contemporary Fittings

A new range of contemporary style lighting fittings designed by Peter Bell, M.S.I.A., was last week introduced to a Press and Trade audience by Allom Brothers, Ltd., Lombard Road, Morden, S.W.19.

Of original design, the range is built up from two or three basic components into many attractive designs, some of which are illustrated on this page.

The fittings will be made from brass tubing moulded parts and aluminium spinnings suitably finished in matt enamel, in all ivory, ivory and Wedgwood blue, or ivory and pale green. Shades are in translucent plastic, aluminium spinnings and stone white pleated buckram.

The majority of the table and floor fittings incorporate a sliding shoe torpedo-type sleeve which by releasing a press button catch, slides up and down the centre stem, making for ease of adjustment to any required angle.



Flange Gaps in FLP Gear

AS a sequel to the discovery that the assumption of linearity relating chance of external ignition to joint gap width for flameproof equipment was incorrect, a recent E.R.A. report by C. E. R. Bruce, M.A., B.SC., M.I.E.E. (Ref G/T279) describes a new method of assessing the statistical maximum safe gap (s.m.s.g.), making at the same time certain recommendations to the British Standards Institution. It also tabulates s.m.s.g. values assessed by the new method, together with those specified in B.S.299:1946 (based on the earlier and less accurate method), for all combustibles on which experiments have been made, but does not concern itself with the specified permissible dimension of joint gap.

Accumulation of experimental information from current E.R.A. work on flange breadths (referred to in our issue of July 16) showed the relationship, initially assumed linear, following a curve of elongated "S" form. For ½ in. flange breadths the error between the two methods was appreciable, necessitating the reassessment for both 1 in. and ½ in. flanges. As discussed in the supplement to the report, the curve obtained corresponded closely to the integral of a "normal distribution curve" and this has been adopted as the basis for re-assessment. The chief values of this type of curve (the "normal integral") is that it has been fully investigated for important cases where available data is meagre, a condition often experienced in these experiments.

To assess s.m.s.g. values, a normal integral curve is fitted to that of experimental points showing variation of chance of internal ignition with flange gap width. From this can be estimated the gap for which chance of an external ignition falls below one in one million—recommended in the report as an acceptable risk—and this is defined as the statistical maximum safe gap G^1. Further allowance is then made for the limited data (compared with infinity), from which is obtained the final figure, known as s.m.s.g. (R).

REMEDYING POLE DECAY

WELL creosoted overhead line poles of redwood should have a service life of the order 40 to 80 years, yet during the past few years a large number have failed through internal decay after only about 15 years' service. When such poles have been examined it was invariably found that they had not been properly treated: the outer band of perishable sapwood which ought to have been fully penetrated with creosote, is only partly penetrated. In service, infection has found its way through splits leading to the outer surface of the pole, and decay has been set up.

This problem is discussed in E.R.A. technical report O/T10 (Mr. D. N. Smith) and an evaluation is offered of the Cobra process of remedial treatment. In this, a water soluble preservative paste is injected into the pole at intervals around its circumference by means of a special hollow needle tool. Injections are made from about 18 in. above to 18 in. below the ground level. Where there is sufficient moisture present, the preservative paste dissolves and diffuses from the incisions into the surrounding wood. In this way it may reach and kill any wood rotting fungi and preserve any uncreosoted sapwood which has not decayed.

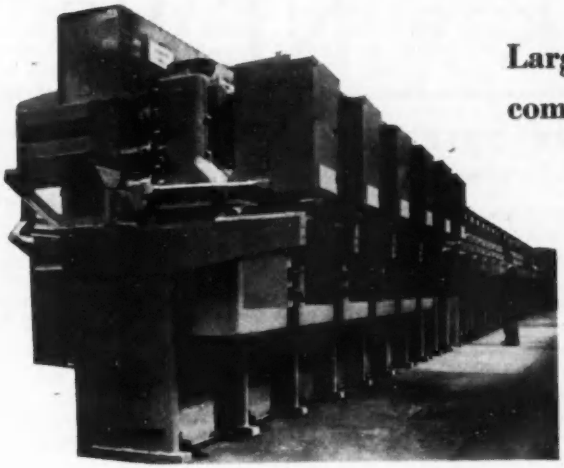
It is only during the past few years that the technique has been used in this country for arresting internal decay in badly creosoted redwood poles, and so experiments have been made to provide interim information on effectiveness until the results of long-term field trials become available.

The results of these experiments suggest that the preservative travels downwards beyond the lower horizontal limit of the treatment, i.e., towards the wetter part of the pole, but it does not diffuse upwards above the top limit of the treatment to where the wood is drier. Thus the treatment is not likely to have much effect above this level.

Location affects Usefulness

In practice, decay occurs at all levels and at present there is little evidence to indicate whether it is likely to occur at one level more than another. In new timbers it nearly always occurs near the ground line, where the wood is continually damp and well-aerated, but in badly creosoted poles this consideration may not apply. Rain driving into any splits that develop will generally provide sufficient moisture to support decay whatever the height. Thus the location of the decay in defective poles will be the main factor in deciding whether or not it will be possible to extend the useful life of poles by remedial treatment of this type.

Switchgear—in a hurry!



Large oil refinery order completed in six months is now on its way to Venezuela

A LARGE order for switchgear, completed by Messrs. A. Reyrolle and Co. Ltd., Hebburn-on-Tyne, in a little more than six months, as compared with the usual year and a half, is now *en route* to the Shell Petroleum Co.'s Cardon refinery in Venezuela. The rapid growth of this refinery since its inauguration four years ago would have necessitated the replacement, in the near future, of the existing 250 MVA switchgear by equipment of greater rating to cater for the planned increase in capacity up to 30,000 kW. While this matter was under consideration a disastrous fire broke out which destroyed the existing switchgear and caused a complete shut-down. Emergency gear from Shell's own stocks was rushed in to provide a makeshift supply system, and steps taken to replace this at the earliest moment.

Switchgear Details

As the price of £116,000 submitted by Messrs. Reyrolle and the delivery date quoted compared very favourably with that given by U.S. firms, the order was placed in England for a 103 ft long, 28 panel metalclad switchboard (6·6 kV 60 c/s duplicate busbar) comprising Reyrolle type "B5T" gear with a rupturing capacity of 500 MVA at 6·6 kV. Associated with it is a 32-panel control board equipped with all the necessary control protective relays, recording and indicating instruments.

The busbar chambers, current transformer chambers and cable boxes are compound-filled, and the horizontal-drawout oil circuit-breakers are solenoid-operated. They incorporate turbulator arc control devices and have a breaking capacity rating of 500 MVA.

The switchboard is arranged in three sections with provision for the addition of a further section at some future date. Each section of the switchboard and each busbar-section panel is accommodated in separate compartments with fireproof doors. Each circuit-breaker is individually vented to atmosphere through the rear wall of the switch house and oil drainage facilities are provided.

Protection

The busbars are protected by a system of leakage-to-frame protection in five zones, and provision is made for the addition of a sixth zone when the fourth section of the switchboard is added. Generator circuits are protected by a Merz Price current-balance system and feeder circuits are equipped with solkor protection. In addition, all circuits are equipped with over-current protection.

The switchgear can be operated locally at the panels for testing or emergency purposes, but is normally controlled from corridor type control and relay panels in the control room. These panels are of sheet steel cubicle construction and are finished eau de nil with bright black fittings. The instruments, mimic-diagram and the indication and control equipment together with the synchronising apparatus and the generator automatic voltage regulators are all on the front panels, the relay and metering equipment being mounted on the rear panels.

The WEEK in NEWS

No Winter Load-Spreading

Industry free this winter from National Restrictions

NO national load-spreading target should be set this year. This is the recommendation of the Electricity sub-Committee of the Ministry of Labour's Joint Consultative Committee, and it is one that the Government has accepted. Announcing this decision in the House of Commons last week, the Minister of Labour made it clear that the sub-committee have recommended that regional boards should have discretion to make load-spreading arrangements in the light of conditions likely to arise in their respective areas.

The sub-committee have again recommended that all possible encouragement should be given to the use of private generating plant and that domestic and small commercial consumers should again be asked to exercise maximum economy during the hours of peak load.

The Minister confirmed that both sides of the National Joint Advisory Council (of which the J.C.C. is a committee) have in mind the fact that the grave shortage of house coal which is likely next winter may affect the demand for electrical power.

Last year the Report of the sub-committee called for a 10% reduction in industrial maximum demand during the morning and afternoon peak periods. It was then considered that such an objective could be attained without any large-scale staggering of working hours, provided the maximum use was made of private generating plant.

Hoover to Manufacture in Australia

THE formation of a company, Hoover Industries Pty., announced by the chairman of the parent company Hoover (Australia) Pty., Mr. John S. Drysdale, brings to light the plans of the company to manufacture in the Commonwealth, many of the Hoover products at present imported from Britain.

Consent has already been obtained to the issuing of capital which would be provided by the parent company in Britain. The factory near Sydney will employ 250 people.

NO F.B.I./B.E.C. MERGER

THE merger planned between the Federation of British Industries and the British Employers Confederation will not occur.

The Employers Confederation deals with labour and economic problems in industry; on the other hand the F.B.I. deals with the solution of general economic and commercial questions; includes among its members both trade associations and individual firms. In view of the different character of their work a merger of the two associations would result in a top-heavy administrative organisation.

Controls off more iron and steel goods

CERTAIN iron and steel products, namely, colliery arches, pit props, cold drawn tubes, malleable iron pipe fittings, wire and wire products and assembled railway wheels and axles are now no longer subject to price control.

An order made by the Minister of Supply, the Iron and Steel Prices (No. 4) Order, 1953 (S.I. 1953, No. 1137), covering this decontrol, came into effect on Monday.

In addition, the Order reduces by 7s. 6d. per ton the maximum permitted price of heavy steel products delivered to S. Wales.

15% More Pay Demand by Engineering Workers

PAY increases of 15% for all adult male workers have been claimed by the Confederation of Shipbuilding and Engineering Unions from the member companies of the Engineering and Allied Employers National Federation.

Affecting altogether 3 million workers, the increase, if granted, would mean an increase of £1 per week for skilled workers and 17s. 6d. for unskilled workers, and has been calculated to cost the industry a total of about £125 million.

The First Half-Century

On an affair of domestic interest the I.E.E. is taking a welcome step. Tomorrow afternoon the members will be asked to sanction the purchase of property in Tothill Street at a price of £16,500. Thus the Institution takes the first big step towards acquiring a home of its own. It would, of course, be unwise to embark prematurely on building operations, but the fact that a site has been acquired should stimulate subscriptions to the Building Fund and bring nearer the day when the Council will be justified in calling in an architect. Meanwhile the property will be a safe source of income.—*From our issue of July* 30, 1903.

THE "IMPOSSIBLE" ACCIDENT

A FLASH-OVER from 132 kV cables 30 ft above ground level, to a man carrying a plank below was impossible, according to the experts. But at Glamorgan Assizes last week, Mr. L. Thomas was awarded £2,000 damages and £630 special damages against the British Electricity Authority in respect of injuries received in just such an incident, according to the claim. True, Mr. Justice Oliver, also admitted that he could not solve the problem of how the occurrence happened, and in making the award he granted a stay of execution for 21 days for the B.E.A. to lodge an appeal, on condition that £200 was paid into court immediately. The accident occurred on a fine sunny day in July 1949, when the plaintiff was helping to build a bus shelter at the Treforest Trading Estate. His counsel stated that while Thomas was carrying a plank of wood near two pylons holding 132 kV cables, there was a flash, an explosion, and he was seen on the ground with his clothing alight. He was unconscious for five days. The plaintiff had to have numerous skin grafts, and was disfigured and permanently partly incapacitated.

Expert witnesses called on behalf of the B.E.A., included Dr. J. S. Forrest (director of B.E.A. Research Laboratories), Dr. Golde (of the E.R.A.) and Prof. W. J. John (of Queen Mary College).

Giving judgment, Mr. Justice Oliver said that experts had maintained that such an accident was impossible. But it could not be impossible because it did happen. He could not solve the problem, but Thomas's body was grossly disfigured by burns and the man must have gone through dreadful suffering.

Commonwealth Science Bursary Scheme

TO fill a need in the scientific relations of the British Commonwealth of Nations the Royal Society and the Nuffield Foundation have jointly initiated a Commonwealth Bursaries Scheme.

The objective of the scheme is to provide facilities for increasing the efficiency of investigators of proven worth by enabling them to pursue research, learn techniques or follow other forms of study where either or both the physical and personal environment overseas in the Commonwealth is peculiarly favourable.

The main difference is that these bursaries aim at improving the powers of the recipient to extend the bounds of knowledge.

To be operated for five years at first, the Nuffield Foundation will provide £5,000 p.a. to be devoted to bursaries to U.K. scientists who wish to go to overseas parts of the Commonwealth and scientists of one overseas part who wish to go to another part. The Royal Society will provide £2,500 initially, to be available for any movement within the Commonwealth, including to the United Kingdom. Each bursary will provide the cost of travel and maintenance normally for periods two to twelve months.

Peat Turbine and Commons Luncheon

MEMBERS representing the Highlands constituencies attended a luncheon given by Sir David Robertson (Caithness and Sutherland) at the House of Commons at which Mr. Henderson Stewart, Under-secretary of State for Scotland, was a guest, to celebrate Governmental approval of the £500,000 North of Scotland Board "power from peat" gas turbine scheme at Altnabreac, Caithness (see ELECTRICAL TIMES, July 23, p. 154).

Mr. Thomas Johnston, chairman of the N. of Scotland Hydro-Electric Board, said that everyone in the north was convinced that the board was on a winner. He speculated on the possibility of this scheme developing into something comparable with the age of steam in the lowlands.

In his opinion, Sir Edward Appleton, Principal of Edinburgh University and chairman of the committee investigating the development of Scottish peat deposits, had "fought like a tiger" to get the experimental scheme accepted.

Panelescence

FIRST commercial application of electro-luminescence, a phenomenon created when a phosphor comes under the influence of a rapidly changing electric field (see Electrical Times July 19, 1951, p. 100) developed in the laboratories of Sylvania Electric Products Inc. of America, has been introduced in the form of a "Panelescent Lamp" used to light the dial face of a radio-clock.

No thicker than a pane of window glass the panel produces a uniform light without the use of lamps, tubes, filaments or cathodes, and as employed in the radio clock it simply replaces the glass or plastic face.

Australia Builds 10,000 MeV Accelerator

REPORTS from Australia quote Professor Marcus Oliphant, Director of the School of Physical Sciences at the Australia National University at Canberra as saying that the world's most powerful nuclear accelerator was being built at the university. The present most powerful accelerator at the Brookhaven laboratories in the U.S.A. is said to be rated as a 2,500 MeV plant. The new Australian plant will develop energy greater than 10,000,000,000 electron volts and will take about a year to complete.

Double Figures for Education Bulletin

IT hardly seems five years ago that the Bulletin of Electrical Engineering Education was launched by Professor Eric Bradshaw and his helpers at Manchester University. Yet the issue recently published is indeed No. 10 in the half yearly series of this increasingly successful publication. It achieves double figures with a worthy issue that opens with a provocative essay by Prof. G. H. Rawcliffe calling for the d.c. machine to be considered as a special case of the a.c. Later Prof Hollingworth discusses the relationship of j and -1.

Unions in Dispute at Birmingham

OVER 200 members of the Electrical Trades Union employed on installation and contracting work in the Birmingham sub-area of the Midlands Electricity Board went on strike last Wednesday, but returned to work on Monday. Their action was due to another inter-union dispute, this time involving the E.T.U. and the National Union of General and Municipal Workers.

The position is that a number of men, some on foot and others in radio-controlled vans, who give consumers emergency services up to 10 p.m. are directed by one man at Dale End who is made a charge-hand for the purpose. At the request of the E.T.U. the number on this temporary charge-hand rota was recently increased from 8 to 16. Among the additional men selected was a member of the N.U.G.M.W. who did his first week's duty about three months ago. When that man started his week's duty last week, one member did refuse to carry out his instructions and he was suspended. Officials of the E.T.U. maintained that the temporary charge-hand, a member of the N.U.G.M.W., should be excluded from the rota, but Mr. Braathen would not agree to victimise a member of another union which was a party to the national agreement.

Following discussions between representatives of the E.T.U. members and Mr. Braathen, the men returned to work as normal last Monday. But what happens in 16 weeks' time remains to be seen.

New Railcars for Leeds

CROMPTON Parkinson Ltd. have pointed out to us that the Leeds Corporation railcar No. 602 described in our issue of 16th July, is one of two experimental railcars now being tried out for the purpose of deciding which may be adopted as the standard for future development. We regret any inadvertent implication that this railcar has in fact already been adopted.

OFFICIAL PUBLICATIONS

CHEMICAL RESEARCH BOARD REPORT FOR 1952 (D.S.I.R.). H.M.S.O. 4s. 6d. (see page 200).

MINISTRY OF LABOUR AND NATIONAL SERVICE. Report for 1952. H.M.S.O. 5s.

E.R.A. REPORTS.—G/T279: Flameproof electrical apparatus—reassessment of values of statistical maximum safe gap on the basis of the integral curve of a normal distribution, 6s. 3d. Supplement to G/T279, 7s. 9d., L/T268: Stabilisation of impregnated paper capacitors. Pilot scale tests with azobenzene, 12s. 4d. L/T279: Torsional vibrations of long chain molecules, II, 6s. 3d. O/T10: Examination of a defected creosote pole after remedial treatment by the Cobra process, 7s. 9d.

RESULTS of the HMV "Coronation" Window Display competition show Frank Sisson of Hucknall as the first prize winner of £400; next lucky firm was Edward Bullough Ltd., of Bolton, Lancs. (£200). The displays were judged by an impartial panel comprising Jonah Barrington, Daily Sketch critic and broadcaster, Dr. Wells Coates, O.B.E., R.A.I., F.R.I.B.A., Ph.D., B.A., B.Sc., Miss Joyce Howlett, Editor of Everywoman, and Norman Wilson, Art Director of a well-known advertising agency

Coal Plant for Sydney

CONTRACT to provide a coal preparation plant for the Corrimal Colliery, Port Kembla, New South Wales, has been secured by the Fraser and Chalmers Engineering Works of the G.E.C., through its Australia associates, the British G.E. Co. (Pty.), Ltd.

This coal preparation plant will have a capacity of 200 tons per hour of coking coal. Equipment includes one 10 ft diameter Chance cone with ancillary screening and loading equipment, which will comprise Sherwen electro-magnetic screens and F. and C. shaker-type screens. In addition a water clarification plant is to be supplied.

This special canteen kitchen formed part of the display of the South Wales Electricity Board and E.D.A. at the Royal Welsh Show. The meals prepared were served to staff in the adjoining canteen

City and Guilds Progress Last Year

DURING 1952, no fewer than 69,337 candidates sat at 900 centres in Great Britain and Northern Ireland for the examinations of the City and Guilds of London Institute. This information is given in the recently issued Report on the work of the Institute's Department of Technology. (From the Department, price 2s.) In addition, there were 7,095 candidates from overseas. The highest single subject total was for telecommunications (26,201), but electrical engineering practice (2,377) and electrical installation work (1,794) were also in considerable demand.

1952 was a particularly memorable year for the Institute because H.R.H. The Duke of Edinburgh as president occupied the chair at the A.G.M. and presented the newly founded insignia awards. There was a major extension of the Institute's activities during the year with the acceptance of responsibility for the administration and secretariat of a new examining body—the Joint Examinations Board for the General Certificate of Education. It is hoped that this new body will result in a new type of secondary school, more suitable for boys and girls entering industry than is the more academic grammar school.

HIGHER EDUCATION

DETAILS of advanced courses in technological subjects on a part-time and evening basis, which are available in the London area, are given in a bulletin issued by the London and Home Counties Regional Advisory Council for Higher Technological Education. This well-indexed publication should be most useful to engineers and students who wish to study advanced techniques, and is obtainable from the Secretary of the Council at Tavistock House South, Tavistock Square, London W.C.1, price 1s. 6d.

Those Belfast Tenders

AT a special meeting of the Belfast City Council on Monday, it was decided to sanction the acceptance of the tenders of C. A. Parsons and Co., Ltd., and Babcock and Wilcox Ltd., for plant for the new Power Station West (to which tenders we have previously referred). An amendment to refer back to the Electricity Committee the contract of Babcock and Wilcox Ltd. for seven boilers, etc., with a direction that tenders be invited by public advertisement was defeated by 23 votes to 14.

We have already noted this month the controversy over the boiler plant contract and the proposal to advertise for tenders.

Electricity or Gas?

Lakes Council decides

RAISING the question of supplies of electricity to the older council houses at a meeting of Ennerdale Rural District Council, Councillor J. R. Gilbertson made reference to derogatory remarks about the R.D.C., made at a meeting of the Northern Gas Board Consultative Committee.

Declared Councillor Gilbertson, "We know what the people in our district want and will do our best to see that they get it." This point of view was later reaffirmed by the chairman of the Housing Committee, who emphasised that supplying both gas and electricity to new housing estates would mean extra rents. The majority of prospective tenants would prefer electricity and the council would see they got it.

Need for Technologists

LORD PROVOST SIR JAMES MILLER, chairman of governors of Heriot-Watt College, Edinburgh, said he hoped the present lack of technologists would soon be remedied, when presenting prizes at the college recently. There was, he added, still an excess demand for mechanical, electrical and mining engineers.

BIRD SONGS AT BATTERSEA

The Tree Walk in the Festival Gardens, Battersea, now has a new attraction. From the tree tops comes the sound of bird song, apparently emanating from the numerous illuminated birds among the branches, obviously intriguing this visitor.

The song of the birds has been tape-recorded and is reproduced by loud speakers concealed among the trees.

Franco Signs, Ltd., who are responsible for the entire illuminated display as well as the sound effects, are now carrying out experiments aimed at developing the idea still further.

Britain at Canadian National Exhibition

FOR the first time since the war there will be official British Government participation in the Canadian National Exhibition, to be held August 28 to September 12 in Toronto.

This is the seventy-fourth in the series of annual exhibitions and represents the products of agriculture and industry in Canada from Atlantic to Pacific coasts.

Britain's display is 70 ft by 28 ft wide, and will incorporate an egg-crate display of a variety of British products at one end and displays including kitchenware and dining-room equipment on the other sides. Three main displays on each side wall will show glassware, pottery, silverware, cutlery and furnishing fabrics.

New List of Buyers

NOW that members and students of the Purchasing Officers Association total over 3,000, the association has decided to publish a new list of members.

Since the last list was issued in February 1950, membership of the association has increased by over 50% and the number of branches and groups raised from 25 to 41, including new branches in South Africa and Australia.

The new 122 page list includes details of the association membership regulations and examination syllabuses and is divided into separate sections covering U.K., Australia and S. Africa; in each case an index of firms is provided. A few copies are still available from the association, price 5s.

Voluntary Work on Swimming Pool

ELECTRICAL engineering firms in Dumfries have agreed to work as a team and carry out at cost price electrical work in a proposed swimming pool, we hear. Electricians have offered to do voluntary work in the evening. A public appeal for funds is to be launched so that the burden on the rates may be reduced as much as possible.

NEWS IN BRIEF

A pit sunk nearly 100 years ago at the Darfield Main Colliery at Wombwell has been converted completely to electric winding. Previously only men had been raised and lowered by the electric winding engine, coal tub raising had been by steam.

Bulk replacement of street lamps is to be tried for 12 months by Southend Corporation instead of the present system of changing them individually as they burn out.

Technical and professional training in English and Canadian factories of the English Electric Co., is being offered to 25 students selected from Canadian universities. Ten will have a two-year fellowship course at the English works.

An appeal for renewed efforts in rural electrification is made in the new charter for rural Wales set out in the report of the Council for Wales and Monmouthshire. It is designed primarily at arresting the depopulation of the countryside.

Immediately after the Radio Show, i.e. on September 19, our contemporary, *Wireless and Electrical Trader*, will resume weekly publication. Founded in 1923 as a monthly, the *W. and E. Trader* became a weekly in 1925 until 1941, when the wartime paper position caused it to be published fortnightly.

"Through Four Reigns," Clough Smith and Co., Ltd., of Redhill, Surrey, have carried on business as engineers and contractors since they commenced business in 1910. An account of their work in traction, cable-laying and installation work has been published under the title which begins this note.

Annual report of the Professional Classes Aid Council for 1952-53 was presented by the chairman at their meeting on July 2.

Conference of nearly 300 nuclear physicists from 19 countries took place at Birmingham University recently.

New premises to replace those destroyed by fire in 1949 are being built by the Southern Electricity Board at Yeovil.

Latest publication produced by E.D.A. to advocate electricity deals with the use of power by the private gardener. This 32-page handbook is entitled "Electricity in Your Garden," and has been divided into three sections: namely, soil warming, greenhouse heating and other uses of electricity.

Questions in Parliament . . .

Air Pollution Inquiry

Answering several questions about air pollution last week, Mr. Ernest Marples said that a committee of inquiry was to be appointed jointly by the Ministers of Housing and of Fuel and the Secretary of State for Scotland. Its terms of reference are "To examine the nature, causes and effects of air pollution, and the efficacy of present preventive measures; to consider what further preventive measures are practicable; and to make recommendations." Chairman of the committee is Sir Hugh Beaver, M.Inst.C.E., M.I Chem.E

Commonwealth Scientific Conference

Forty-four recommendations were made by the 1952 Commonwealth Scientific Conference, according to a written reply on Thursday. In this country the standing committee appointed to follow up the recommendations has already initiated action on the great majority. In particular, in accordance with Recommendation 33 a study has been undertaken of the problems involved in the supply by the Commonwealth of scientific and technical personnel to help underdeveloped countries.

Technical College Fees

The question of arrangements between bordering educational authorities to allow reduced fees for "over the border" students at technical colleges was raised in an adjournment debate on Thursday by Mr. W. Wells. He suggested that a firm central policy for such agreements should be laid down by the Ministry of Education, and that some indication should be given about the dispersion of courses. In his reply, Mr. Kenneth Pickthorn suggested that the Minister endeavoured with success to avoid overlapping. He further stated that 75% grants for technical colleges are not granted unless there are satisfactory arrangements for the admission of out-county students.

Merchandise Marks Bill

On Friday the House of Commons gave a third reading to the Merchandise Marks Bill. This deals with descriptions of goods, and the President of the Board of Trade characterised the purpose of the Bill as "perhaps to bring the practice of all a little nearer to the practice of the best . . ."

Sulphuric Acid

The Minister of Materials stated in the Commons that 30% of the sulphuric acid in Great Britain is made from home-produced materials.

Railway Electrification

Replying to Mr. Sparks, Mr. Lennox-Boyd, Minister of Transport, said that the only concrete proposal for railway electrification to come to the Minister recently was that for the Fenchurch Street-Southend line, which he has approved in principle. He thought that electrification of railways in the North of Scotland might well come about.

Patent Delays

Mr. P. Thorneycroft, replying to Sir D. Campbell, gave two years and eight months as the time which now elapses between the receipt of a complete specification by the Patent Office and the sealing of the patent.

Supplies at Basildon

In a question to the Minister of Housing, Mr. Braine alleged that the development of heat, light and power services to parts of the new town of Basildon were being impeded as a result of the protracted negotiations between the Corporation and the Eastern Electricity Board. In a written reply Mr. Marples said that the Minister was not aware of this cause of delay.

Smokeless Zones

In a written reply Mr. Marples, Parliamentary Secretary to the Ministry of Housing, said that the Minister would encourage local authorities to establish smokeless zones where such a course is practicable.

Supply in Scotland

A written reply of the Secretary of State for Scotland states that he is actively considering legislation to bring about changes in the present organisation for electricity supply in Scotland, and that he is in consultation with the Ministry of Fuel and Power on the matter.

Coal Distribution Costs

There is no need or desire at present for a committee to inquire into costs of coal distribution, states Mr. Geoffrey Lloyd, in a written reply to Mr. Timmons.

Coal and Air Pullution

In a reply to Sir E. Keeling, Mr. Joynson Hicks, Parliamentary Secretary to the Ministry of Fuel and Power stated that he did not expect that the recent changes of coal prices (inferior grades, reduced; better grades, increased) would have any effect on the atmosphere of large towns.

Steel Plate

Replying to two members on Monday, the Minister of Supply, Mr. Duncan Sandys, recalled that the report of the Iron and Steel Consumers' Council suggested that adequate steps are not being taken to ensure that in future years supplies of plates will be sufficient to meet the increased demand. He further mentioned that the Council noted that there were differences of opinion within the industry on this matter, and he said that he had drawn the special attenton of the Iron and Steel Board to this part of the Council's report.

Electric Supply News . . .

Eire

In addition to a site at Deelis Bridge, near Cahirciveen, Co. Kerry, (as we noted on July 16) another electricity generating station to be fired by hand-won turf is to be constructed at Stacpoole's Bridge, near Miltown Malbay, Co. Clare. Sites for two other similar stations to be erected in Connemara and Donegal have not yet been settled by the Electricity Supply Board. Plans for the construction of the four small power stations were announced in June by Mr. Lemass, the Minister for Industry and Commerce. It is hoped to have the stations in operation in about three years' time—each will require about 30,000 tons of turf annually.

Evesham

Tenants occupying hutments at what was a war-time airfield at Honeybourne, have been complaining of the alleged high cost of the electricity supply there. The supply is provided by the Ministry of Works, the bulk supply being given by the Midlands Electricity Board who, of course, have no control over the price per unit charged to the tenants. It has been stated that charges for current have been increased sixfold because of losses sustained by the Ministry. To avoid their supply being cut off, council tenants and other electricity users agreed to pay the increased charges, but Mr. T. C. Collins, who lives in the old control tower and farms 500 acres of airfield land, refused to sign an agreement which, at his usual rate of consumption, would have meant a charge of about £600 a year for his farm buildings and about £200 a year for his house, it is reported.

The Electricity Board have pointed out that to supply the tenants direct, a new distribution system would be needed, which could not be done immediately because it would have to take its turn in the Board's rural development programme.

S.W. Scotland

The South West Scotland Electricity Board has approved of schemes for the reinforcement of supply at Greenock at a cost of £267,000, Dumfries at £242,000, Beith at £13,864 and the Netherlee, Stamperland, Clarkston area of Glasgow at £8,648. In addition, the Board have approved schemes for providing supplies to 3,310 new houses at Drumchapel, Glasgow, at £138,073 and 300 new houses at Simshill, Cathcart, at £27,334.

LIGHTING SCHEMES

Hyde.—Application being made to borrow £1,514 for the provision of street lighting on the Hickenfield Estate.

Stourbridge.—T.C. recommended to approve in principle, the conversion from gas to electric lighting in Lower High Street, Enville Street, Bridgnorth Road and Hagley Road, at a cost of £5,105.

Swindon.—The T.C. has been recommended to approve schemes for improved lighting in Newport Street, County Road, Milton Road, Commercial Road and part of Regent Circus, at a cost of nearly £5,000.

Company Activities . . .

Cable Investment Trust

There is to be a final Ordinary dividend of 5% again making a total of 8% for the year to June 30 last. The profit for the year is £212,780, as against £215,330 for the previous period, after charging taxation of £183,948 (*£193,603*).

Calcutta Tramways Co.

The preliminary statement for 1952 shows net revenue at £82,510 as against £82,757 for 1951. This figure is struck after charging taxation of £95,000 (*£150,000*) and setting aside the agreed sum of £80,000, as before, to renewals and replacements. The accounts have been drawn up on the basis of the August, 1951, agreement with the Governor of the State of West Bengal, under which the tenure of the company was extended for 20 years till January, 1972. Mr. Webb's visit to Calcutta, the scene of recent disorders, is noted on page 211.

Campbell & Isherwood

With a higher profit resulting from operations in 1952, the directors have recommended that the dividend be increased by 5% to 15%. The net profit for the year is £31,604 compared with £14,944 for the previous year, and this after charging taxation of £50,600 (*£29,284*).

Electric Furnace Co., Ltd.

There is to be a one-for-one scrip issue to Ordinary shareholders. The directors also propose a scrip issue of three 7% Cumulative Preference shares for every seven Cumulative Preferred Ordinary shares held in return for the Preferred Ordinary holders surrendering their participating rights. The Preferred Ordinary will be converted into 7% Cumulative Preference. The result, apparently, will be that holders of the Preferred Ordinary will find themselves in the same position as regards the amount receivable by way of dividend as they have been in past years when the full

participation dividend has been paid, except that in future their full dividend will rank before the Ordinary instead of only part. The matters come before a meeting called for August 18.

General Electric Co. Ltd.

The sharp decline in the group profit for the year ended March 31 last, has surprised certain quarters. The group profit is £4,230,234, compared with £6,603,957 for the previous year. But the distribution for the year is slightly raised, there being a final dividend of 7½% making a total of 11¼% on the increase capital, which absorbs £716,347. For the previous year the distribution involved £628,181 with a total dividend of 22½% on the smaller capital. After charging U.K. and overseas taxation, the consolidated net profit attributable to the holding company amounts to £1,266,054 as against £2,091,114 for the previous year. In addition, the sum of £2,827,033 net profit relating to previous years, of which

Year to Mar.31	£ Trading Profit	£ Net Profit*	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	4,996,454	1,494,677	57	17½	92/3	70/9
1950	6,021,980	1,709,404	66	17½	86/-	72/-
1951	7,424,716	1,978,039	81	22½	99/6	81/3
1952	8,793,215	2,091,114	69	22½†	46/1	35/9
1953	6,709,306	1,266,054	17	11¼	43/-	38/-

* Available for the parent company.
† Plus 100% capital bonus.

£2,420,172 arose from the settlement of the group's liability to E.P.T., has been brought into the group profit and loss account, compared with £483,674 the previous year.

The reduction in profit was due to the steep fall in sales of consumer goods both at home and abroad, Sir Harry Railing, the chairman, explains, although the total turnover for the year showed a considerable increase—output of capital goods continued to rise resulting in a record production for the year. The order book for capital goods at the end of the financial year was satisfactory, but since then the outlook has tended to become less favourable on account of the shortage of finance the world over and the increased competition in all markets. Orders for consumer goods show slight signs of improvement and there are indications that the deterioration experienced during the last financial year has stopped, he adds.

Globe Telegraph and Trust Co.

The final dividend is 5% for the year ended June 30 last, again making a total of 8%. After charging taxation of £203,033 (*£183,455*), the profit is £230,645 compared with £204,537 for the previous year.

Nigerian Electricity Supply Corporation, Ltd.

With a final dividend of 4% plus bonus of 2%, the total distribution for the year ended February 28 last is again 10%. The net profit for that year amounts to £143,304—an increase of £23,204 on the previous year's figures. This figure is struck after charging £45,000 (*£35,000*) for depreciation but before taxation of £81,228 (*£67,529*).

Oldham Bros. (Africa) Ltd.

The local plant for the production of heavy industrial storage batteries has been in operation for a number of months, Maj.-Gen. K. Ray, the vice-chairman, states. The company is soon to be moving further into the field of commercial and competitive manufacture, he reveals.

Pirelli-General Cable Works Ltd.

Unlike some other cable manufacturers, this concern reports an increase in its net profit for the year to March 31 last, despite the larger amount absorbed by taxation at £810,043; the net profit is £38,126 higher than for the previous year while taxation takes £1,069,739 compared with £731,228 previously. The distribution, however, remains as before, with a dividend of 8% plus bonus 12%.

Reliance-Clifton Cables and Industrial Products Ltd.

This company also reports an immediate curtailment in demand following the announcement that copper will be freed in August. Mr. H. Davis, chairman, adds that there is considerable competition for the available business. In the circumstances any forecast is liable to be completely upset by a market change in conditions—one way or the other—in the second half of the current year.

Revo Electric Co., Ltd.

The trading profit figure was fairly well maintained in view of the extremely difficult trading conditions which were experienced in certain sections of the business and in particular the domestic appliance field and foundries. Mr. W. L. Barrows, the chairman, considers that the

Year to Mar.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	348,987	144,050	71	27½	61/3	44/4
1950	289,246	112,306	56	27½	45/6	37/3
1951	348,043	121,763	63	27½	48/9	38/11
1952	478,964	170,542	88	27½	43/-	30/-
1953	463,682	171,590	85	27½*	47/6	41/9

* Plus 200% capital bonus.

outlook is too uncertain to give any guidance as to the position for the current year, but the company is well placed to take advantage of any improvement in trade.

Ruston and Hornsby Ltd.

A Coronation bonus of 1¼% in addition to the usual 11% for the year ended March 31 last, is recommended. There is, in fact, a noteworthy increase in the combined net profit for that year. At £1,126,522, that total is £228,221 higher than for the previous year. The figure is struck after deducting £1,906,296 (*£1,763,795*) for taxation, depreciation, plant replacement provision and debenture interest, and includes £208,454 (*£186,346*) investment and other income.

Dividend Declared

Mather and Platt Ltd. Interim Ordinary dividend at 4%.

Commercial Information

CONTRACTS OPEN

HOME

July 31.—Dublin T.C. Electrical installation in nurses' home at St. Mary's Chest Hospital. N. Mathews, consulting engineer, 42 Fitzwilliam Place. Deposit £10 10s.

July 31.—Dundee. Electrical and heating work at Blood Transfusion Centre of Dundee Royal Infirmary. Apply by above date to Regional Engineer, Eastern Region Hospital Board, 430 Blackness Rd., Dundee.

July 31.—Horsham (Sussex) U.D.C. Supply and erection of 34 concrete columns with mercury discharge lanterns, and 39 concrete columns with metal filament lamps on Needles Farm estate. J. P. Ridd, Engineer and Surveyor, Council Offices, Horsham Park.

July 31.—Midlothian. Supply and erection of 77 concrete columns and installation of 80 W mercury lamps, etc., for Group B lighting at Newbattle New Community scheme. County Surveyor, 32 Palmeston Place, Edinburgh.

Aug. 1.—Ross and Cromarty. Installation of electric lighting and power in 22 houses on Isle of Lewis. Applications by above date to P. S. Leake, County Architect, The Old Academy, Dingwall.

Aug. 1.—West Riding. Electrical installation at Aberford secondary school, Parlington Park Camp. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £2 2s.

Aug. 3.—Ely R.D.C. Electrical equipment in 22 houses at Little Thetford. Engineer and Surveyor, Rural Council Offices, 11 Lynn Rd., Ely, Cambs.

Aug. 3.—Manchester T.C. Electrical installation at "Lawnhurst" in Wilmslow Rd. City Architect, Town Hall. Deposit £1 1s. (See July 9 issue.)

Aug. 3.—Ballymena. Electrical installation at new secondary school, Convent of St. Louis, Ballymena, Co. Antrim. P. and P. Gregory, architects, 25 Gresham St., Belfast.

Aug. 5.—Belfast T.C. Electrical installation at new fire station, Lisburn Road. City Architect's Dept., Architectural Sec. (Room 85), City Hall, Belfast.

Aug. 5.—Lancs C.C. Electrical installation at Prescot and Huyton Girls' Grammar School. Apply to County Architect, County Hall, Preston, by above date.

Aug. 6.—Belfast T.C. Electric lighting installation at Newark room block and additions to electric installation at existing school building, Linfield Intermediate School, Blythe St., Belfast. Education Architect's Dept., Academy St., Belfast.

Aug. 6.—Belfast T.C. Lighting installation in Currie primary school extensions, Cosgrave St. Education Architect's Dept., Academy Street.

Aug. 7.—Chorley T.C. Conversion of existing columns and provision of new lighting points to a total number of 89 at Croston. Engineer and Surveyor, Council Offices, Gillibrand St., Chorley.

Aug. 7.—Lancashire C.C. Electric wash boilers for new police houses in the county area. Apply to County Architect, County Hall, Preston, by above date.

Aug. 7.—Montrose T.C. Installation of sodium discharge street lighting over 2·24 miles of trunk road A92. Burgh Surveyor, Town Buildings, Montrose.

Aug. 8.—E. Kesteven R.D.C. Supply, erection, etc., of pumping machinery, each pump complete with electric motor and automatic switchgear. Consulting engineer, Silcock and Simpson, 10 Park Row, Leeds. Deposit £3.

Aug. 8.—Manchester. Electrical installation at Oldwood secondary school, Wythenshawe. City Architect, Town Hall. Deposit £1 1s.

Aug. 10.—Mildenhall R.D.C. Supply and erection of duplicate booster pumps, with motors and switchgear. Pumps of 15,000 gal/hr at 35 ft capacity. Council Offices, Mildenhall, Suffolk. Deposit £3.

Aug. 10.—Staffordshire C.C. Provision and installation of an electric goods lift at the Hospital Block at Fernleigh Hostel, Marston Rd., Stafford. Apply to T. H. Evans, Clerk of the County Council, County Buildings, Stafford, by above date.

August 10.—West Riding of Yorkshire C.C. Re-wiring of electrical installation at Rothwell Stourton Infants' School. Particulars from County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Aug. 10.—West Riding of Yorkshire C.C. Electrical installation at Hoyland Elsecar Church of England school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Aug. 11.—East Riding C.C. Supply and fixing of electrically operated flasher units and illuminated beacon globes at pedestrian crossings in the county. County Surveyor, County Hall, Beverley.

Aug. 12.—Edinburgh T.C. Electrical engineering work at Inch primary school, No. 3. City Architect's Office, City Chambers, Edinburgh.

Aug. 12.—Guildford T.C. Supply, erection and wiring of street lighting equipment and steel columns as follows: (*a*) Guildford by-pass road, 107 250 W M.V. units; (*b*) Aldershot Road, 44 250 W M.V. units, and (*c*) Onslow Street, 16 3 x 80 W fluorescent units. Also supply and laying of cable and equipment for street lighting at the first two named roads, involving 6,620 yd and 420 yd of cable respectively. Borough Engineer, Municipal Offices, High Street, Guildford. Deposit £3 3s. each for both specifications, etc.

Aug. 14.—Sheffield T.C. Electrical installations for the following housing estates: (*a*) Greenhill estate, scheme No. 1, 184 dwellings; (*b*) Manor Park estate, scheme No. 5, 177 dwellings; (*c*) Hackenthorpe estate, scheme 1a, 372 dwellings; (*d*) Hackenthorpe estate, scheme 4a, 42 dwellings. J. L. Womersley, city architect, Town Hall, Sheffield 1. Deposit £2.

Aug. 14.—Sunderland T.C. Electrical installations for shops and flats on three estates. Borough Architect, Grange House,

Stockton Rd., Sunderland. Deposit £2 2s.

Aug. 15.—Cheadle and Gatley U.D.C. Electric light and power and emergency lighting at a prefabricated public hall at Adswood, Cheadle Hulme. Apply to Architects, F. Tomkinson and Sons, 180 Edleston Road, Crewe.

Aug. 15.—Selkirk T.C. Electrical work in 21 houses to be erected at Bannerfield site. Town Clerk, Municipal Buildings, Selkirk.

Aug. 15.—Stretford T.C. Supply of 60 steel poles, about 33 ft for street lighting. A. H. Perry, Borough Engineer, Town Hall.

Aug. 15.—Lanarkshire C.C. Supply of 12 lanterns, leak transformers and capacitors for 140 W sodium discharge lighting for Gretna-Stranraer-Glasgow-Stirling trunk road A80. Apply to County Lighting Engineer, 15 Clydesdale St., Hamilton, by above date.

Aug. 17.—Birmingham T.C. Replacement of passenger lift at the Rates Department Offices, 98 Edmund St. H. J. Manzoni, city engineer and surveyor, Civic Centre, Birmingham 3. Deposit £2 2s.

Aug. 19. — Newcastle-on-Tyne. Lighting, power and impulse clock installations at Stockfield Ave. school. R. W. Gregory and Partners, consulting engineers, Pilgrim House. Deposit £5 5s.

Aug. 20.—Chard T.C. Supply and installation of a street lighting scheme on county and district roads in the borough. Borough Surveyor, Municipal Offices, Chard, Somerset. Deposit £2 2s. (See July 23 issue.)

Aug. 20.—Darlington T.C. Provision and erection of electrically driven 500 g.p.m. vertical spindle sludge pump at Stressholme sewage disposal works. Borough Surveyor, Town Hall.

Aug. 24. — Cheltenham T.C. Supply and erection of sodium street lighting equipment in Group A—including lanterns, lighting equipment, steel columns—for Bath-Lincoln trunk road. C. Gould Marsland, Borough Engineer, Municipal Offices. Deposit £3 3s. (See July 16 issue.)

Aug. 24.—Sutton and Cheam D.C. Erection of 112 25-ft reinforced concrete columns with provision and fitting of G.E.C. lanterns and auxiliary equipment for 140 W sodium lighting on about 2·45 miles of roads. N. H. Mitchell, borough engineer and surveyor, Municipal Offices, High St., Sutton, Surrey. Deposit £1 1s.

Aug. 24.—Southgate B.C. (a) Supply only of lanterns and control gear for 115 140 W sodium vapour discharge lamps; (b) supply and erection of 115 concrete lamp columns, lanterns, wiring, control gear, etc. Borough Engineer and Surveyor, Town Hall, Palmers Green, N.13. (See July 23 issue.)

Aug. 24.—Trent River Board. Installation of new lighting equipment at Board's head office, Nottingham, with conversion from d.c. to a.c. Apply by Aug. 5 to Engineer to the Board, 206 Derby Road, Nottingham. Deposit £2. (See July 23 issue.)

Aug. 26.—Baildon U.D.C. Supply, erection, etc., of 42 250 W MV lanterns on concrete columns in Baildon Rd. and Browgate. Surveyor, Town Hall.

Aug. 29.—Cowdenbeath T.C. Improved lighting scheme on trunk road A90 between the burgh boundary at Perth Road and the boundary at Broad St. Burgh Surveyor, Town House, Cowdenbeath.

Aug. 31.—Salford T.C. Electrical installation at Blackfriars public baths. General Superintendent, Admin. Offices, Blackfriars Public Baths. Deposit £1 1s. (See July 23 issue.)

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

Aug. 18.—Uruguay. Supply of 220 V armoured cables and cable boxes of various descriptions and quantities under Tender No. 3878/53, Spec. No. 2199, for Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref.: CRE 23764/53).*

Aug 20.—U.S.A. For Folsom power plant: three 75 kVA 14,400/120 V distribution transformers and three 66 kV, 145 V, 453 A resistors. B.o.T. (Ref.: CRE 24062/53).*

Aug. 20.—U.S.A. Three 2,400 V metal enclosed motor control assemblies for pumping plants at Columbia Basin project. B.o.T. (Ref.: CRE 24016/53).

Aug. 20.—Uruguay. Tenders invited for supply of 146 automatic circuit-breakers and spares to various specifications by Administracion General de las Usinas Electricas y los Telefonos del Estado. (Tender No. 3880/53. Spec. No. 2201.) B.o.T. (Ref.: CRE 23749/53).*

Sept. 2.—Uruguay. Supply of 500 street lighting suspension units for Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref.: CRE 23630/53).*

Your Queries — Answered

"Kanthal" resistance wire, makers of? J.E.—Hall and Pickles, Ltd., Port St., Manchester. (23359)

"Klamplite" fittings, makers of? E.S.—Battenburg and Co., Ltd., 7 Great Winchester St., E.C.2. (23364)

"Aerovap" insect destroyer, makers of? E.M.—Shepherd's Aerosols, Ltd., 23a Old Bond St., W.1. (23371)

"Lucas" travelling irons, makers of?—S.E. We presume this inquiry refers to the products of Lucas Holder, Ltd., 25 Allesley Old Rd., Coventry. (23378)

Electrically-heated turkish baths for domestic use, makers of? T.E.—J. Foot and Son, Ltd., King Henry's Walk, N.1. (23385)

"Mindus" towel rails, makers of? D.E.—Midland Industries, Ltd., Heath Town Works, Wolverhampton. (23397)

Soil sterilisers, makers of? E.B.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2; Electrocult, Ltd., Station Rd., Harpenden, Herts.; Fel-Electric, 41 Sidney St., Sheffield 1; Farm and Garden Electrification, Ltd., Apha Wharf, Havelock Rd., Southall, Middx. (23394)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Ohm-tite" conduit bush spanner, makers of? A.W. (23396)

Contracts Open—Overseas—cont.

Sept. 21.—Bombay. Two 3,000 kVA, 66/11·55 kV transformers for South Gujarat grid scheme. B.o.T. (Ref.: CRE 24275/53).*

Sept. 8.—Australia. Supply of control board for 33 kV switchgear, another for 11 kV switchgear, and a third for mounting busbar protection equipment for ultimate 33 kV switchgear scheme. (Spec. no. 53/9.) Documents from Southern Electric Authority, Boundary St., Brisbane, at £2 2s. per two copies.

Sept. 12.—Tangier. Water and Electricity Board requires supply of electrical equipment for two transformer stations of 5,500 V and one of 22,000 V. Stations are Parc Auto, Nouvelle Administration, and Anfa. B.o.T. (Ref.: CRE 23140/53).*

Sept. 22.—New Zealand. Seven outdoor, oil immersed 110 kV transformers for the Henderson substation, for State Hydro-Electric Department. Copies of specifications available from New Zealand Government office, in London.

Sept. 30.—Queensland. One 350 kW gas engine driven generator set for the Longreach Shire Council. Deposit £100. B.o.T. (Ref.: CRE 24295/53).*

CONTRACTS PLACED

Northampton T.C. Second stage of scheme for conversion of street lighting to electricity, General Electric Co. Ltd., £8,603.

Peterborough T.C. Electrical installation in 60 houses on Dogsthorpe North estate, M. F. Hanson, £1,407.

Poplar B.C. Electrical work for supply of fittings for flats in Chipka St., Ayr Engineering Co. Ltd., £1,495.

Sheffield T.C. Supply and installation of radio communication system for radio control of ambulances, Marconi's Wireless Telegraph Co., Ltd., £3,630.

Southgate (Middlx) T.C. Street lighting scheme: supply and erection of concrete columns, and installation of lanterns and control gear. Harland and Wolff Ltd., £5,205; supply of 134 sodium lanterns and control gear, General Electric Co., Ltd. £2,907; and supply of 35 mercury lanterns and control gear, British Thomson-Houston Co., Ltd., £680.

St. Marylebone B.C. Renewal of switchgear and central distributing cable at Lisson Grove depot. Locke and Soares (1942) Ltd., £3,036.

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	252 0 0	—
LEAD, good soft pig (foreign)	95½-96½	112 0 0
TIN (99·99·76%) ...(Cash)	579½-580	—
,, (3 months)	579½-580	—
ALUMINIUM, commercial purity (del.)	150 0 0	—
ZINC	73-73½	88—92
ARMOURING:		
Galv. Steel Wire (0·104 in.)	50 10 0	—
Mild Steel Tape (0·04 in.)	40 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Alstans Electrical Ltd. Meeting at 126 Colmore Row, Birmingham 3, on August 25 at 2.30 p.m., to receive report of Mr. R. F. Bendall, liquidator, on winding-up.

Delhi Electric Supply and Traction Co., Ltd. W. D. Hume, Suffolk House, Laurence Pountney Hill, E.C.4, appointed liquidator on July 9.

Dryall Ltd. Electrical and general engineers, 3 Randoiph Mews, W.9. A. G. White, 73 Cheapside, E.C.2, appointed liquidator on July 8.

Ezee Appliances (Kingsbury) Ltd. Creditors to send particulars to S. Poynter, liquidator, 1 Broadway House, Mill Hill, N.W.7, by August 11.

Gilbert Electrical Tool Services Ltd. Petition for winding-up to be heard at Royal Courts of Justice, Strand, W.C.2, on October 5. Persons intending to appear should notify Samuel Tonkin and Co., 3 Berners St., W.1. by October 3.

Regent Radio Co. Meeting of creditors at offices of A. C. Palmer and Co., Regent House, 45 Sheep St., Northampton, on August 6 at 2.30 p.m., to receive report of Mr. R. A. Palmer, liquidator, on winding-up.

Smith and Russell (Coseley) Ltd. Radio and electrical engineers, 639 Birmingham New Rd., Coseley, Staffs. R. K. Clark, Somerset House, 37 Temple St., Birmingham 2, appointed liquidator. Last day for receiving proofs, August 5.

Voluntary Liquidation

County Electronics Ltd., 17-18 Stramongate, Kendal, radio, television and electrical engineers. At the recent meeting of creditors the statement of affairs showed liabilities amounting to £3,334 19s. 1d. In addition, there was a sum of £511 2s. 6d. in respect of a debenture and for which the Receiver's realisations amounted to £420 5s. 6d., leaving a balance outstanding of £90 17s. Assets were estimated to realise £859 7s. and after deducting £90 17s. for the debenture and £90 for preferential claims there were net assets of £722 4s. 10d., or a deficiency as regards creditors of £2,612 14s. 3d. The issued share capital was £2,700 and, so far as the shareholders were concerned, there was a total deficiency of £5,312 14s. 3d.

The creditors later confirmed the voluntary liquidation of the company with Mr. A. T. Eaves, C.A., of Harry L. Price and Co., 47 Mosley St., Manchester, as liquidator.

BANKRUPTCY ACTS

London. Alfred John Digby, electrical contractor, trading at 238, Walworth Rd., London, S.E.17, as J. Digby and Co., and at 22d Doughty Mews, London, W.C.1. A deficiency of £345 was admitted by this debtor when he attended London Bankruptcy Court, recently for his public examination. Replying to the Official Receiver, the debtor said that he first commenced business as an electrical contractor in Sept. 1947. From 1949 he had carried out several electrical contracts for a hospital. In Nov. last the hospital authorities ordered some electrical instruments from him and paid in advance. The debtor ordered the goods but they were not available until January last, by which time the debtor had used the purchase money to pay debts, wages, etc. The hospital obtained judgment against him for £271 and the debtor decided to file his own petition in bankruptcy. The examination was concluded.

Dividend

Wigan. Margaret Jane Ruddick, electrical appliance dealer, 89 Park Rd., Wigan. First and final dividend of 2¾d. in £, payable on August 7 at Official Receiver's office, West Africa House, Water St., Liverpool

BUSINESS PROSPECTS

HOME

Aberystwyth T.C. Recommended to approve new layout for 86 houses at Penybont West.

Acton (Middx) T.C. Plans approved for erection of total of 81 flats on five sites. Largest group is 27.

Alnwick R.D.C. County Planning Officer has approved layout of 100 miners' houses at Hillcrest, Shilbottle.

Banstead (Surrey) U.D.C. Scheme to be prepared for 50 dwellings at Tadworth.

Barking. It is hoped to include Ripple Marshes infants' school in next year's main building programme.

Barnsley (Yorks) T.C. Plans approved by Minister of Education for building a secondary modern school at Kendray at estimated cost of £187,000.

Barrow-in-Furness T.C. Recommended to invite tenders for alterations to technical college estimated to cost £10,856. To be included in school building programme is North Walney county primary school, estimated cost £89,936.

Bedlington U.D.C. To erect 28 houses at Woodside, Bedlington Station, at £25,868.

Bishop's Stortford U.D.C. It is proposed to erect about 50 dwellings on site near London Road.

Brentford (Middx.) T.C. Land north of High St. is to be acquired for erection of 7 shops and 10 maisonnettes. Also scheme approved for erection of 106 flats in second stage of Hogarth Lane redevelopment.

Burton-on-Trent T.C. Tenders may soon be invited for modernisation of 213 houses in borough.

Calne and Chippenham R.D.C. To seek approval for the erection of 96 houses in 1954.

Camberwell. Factory for M. E. Beswick Ltd., at Ormside St., S.E.5, to be started in September. Architects are Stroud and Nullis, 25 Ebury St., S.W.1.

Camborne-Redruth U.D.C. To seek approval for the erection of 5 bungalows at Crane Rd. estate, 95 houses at Weeth and Illogan estate and 50 Cornish Unit houses.

Chelmsford. British Vitamin Products are to build two-storey block of offices in Broomfield Rd. Architect is S. Bragg, 16 London Road.

Cheltenham R.D.C. Erection of 100 Wates houses at Askchurch approved by Ministry. The R.D.C. have approved the erection of 30 houses at Bishops Cleave, 88 at Winchcombe and 12 at Northway.

Cheltenham T.C. Secondary modern school approved by Minister of Education for Hesters Way Estate at estimated cost £99,000.

Cork (Eire). To seek Department of Health approval for electrical installations at Crawford technical institute. Estimated cost £5,000.

Coventry. Work to begin next March on erection of police headquarters costing about £300,000 in Little Park Street.

Deal T.C. Plans have been approved by the T.C. for the erection of 138 houses at St. Martin's Rd. site.

Denbigh. Biscuit factory proposed by L. Marsden. Wynn Rogers and Co., Grove House, Vale St., Denbigh, are surveyors.

Dewsbury T.C. Recommended to negotiate for erection of 110 dwellings at Syke Lane and 120 at Dewsbury Moor estate.

Durham C.C. Seeking permission to build new and larger county offices. County Architect, G. R. Clayton, Court Lane, Durham.

Durham C.C. To spend £1,200 on the renewal of the electrical installations at Hartlepool Gallery Field modern school and £700 for that at Sherburn Hill county school.

Durham R.D.C. Approved layout plans for 104 houses at Morley Crescent, Kelloe and 32 at Seamside.

East Ham T.C. Approved the provision of flashing beacons at 37 pedestrian crossings. Estimated cost £3,098.

Esher. Approval granted by Surrey C.C. for secondary school. Estimated cost £104,122.

Felling-on-Tyne U.D.C. Have approved layout plans by Gateshead T.C. for the provision of 424 houses at Blackhill. Layout plan has also been prepared for 161 houses and a block of 2 shops and flats on land west of Ellen Wilkinson Estate. Contracts to be decided shortly by the U.D.C. for 100 houses on the Leam Lane unit.

Folkestone T.C. Land on Biggins Wood estate has been earmarked for erection of primary school.

Frome R.D.C. Erection of 24 houses at Highbury, Coleford, near Radstock. Architect, Humphrey H. Goldsmith, 18 Gay Street, Bath.

Gateshead T.C. To spend £6,000 for civil defence control centre at South Dene Towers.

Gerrards Cross. British Aluminium Co., Ltd., propose additions to their laboratory costing about £35,000.

Grimsby. J. Tate Ltd. are to extend their box factory in Alexandra Road.

Hackney. Ministry of Education approval for the adaption of Cordwainers Technical College by L.C.C. Estimated cost £69,000.

Stockton-on-Tees T.C. Erection of 80 houses and 70 flats at Portrack. Borough Engineer, Gilbert Cowan, Victoria Building, Stockton-on-Tees.

Stockton-on-Tees. R. Cowan, Finkle St., Stockton, is the architect for the proposed "Rimswell Hotel," Bishopton Rd., for J. W. Cameron and Co., Ltd., Lion Brewery, West Hartlepool.

Sunbury-on-Thames U. D. C. When site has been cleared, it is proposed to erect 80 houses in Beechwood Ave.

Torpoint U.D.C. Erection of 16 houses and 28 flats on Queen's Park estate. E. W. Penn, Clerk of Council, Council Offices, York Road.

Walsall T.C. Erection of second instalment of the Forest County secondary school in Hawbush Rd. Architects, Lavender, Son and Close, 50 Bradford St.

Wallsend. Plans approved for machine shop at Parsons and Marine Eng. Turbine Research and Development Association. Engineers are: R. T. James and Partners, St. Nicholas Buildings, Newcastle.

Welwyn (Herts) R.D.C. Layout plans approved for 152 houses, including three shops, in London Road.

Worsborough (Yorks) U.D.C. To install electricity in houses at Blacker Hill. Estimated cost £1,530.

Worthing T.C. R.C. secondary school costing about £95,000 to be included in next year's building programme.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Booth, Wade and Co., Ltd., 53 Main St., East Ardsley, nr. Wakefield. Heating, ventilating, air-conditioning, dust and fume collecting, drying and general engineers, etc. Cap.: £1,000. Dirs.: Miss E. M. Horner, K. F. Horner, E. Booth and B. Wade.

Contract Installations Ltd. General, heating, ventilating, lighting, mechanical, electrical, radio, motor, refrigerating, constructional and consulting engineers, etc. Cap.: £2,000. Dirs.: A. R. Blackwood, G. S. Diamond and M. G. Loader. No address given.

Electric Audio Reproducers Ltd., 1 Hanover Sq., W.1. Manufacturers of and dealers in electrical and electronic sound reproducing and recording equipment, etc. Cap.: £5,000. Dirs.: to be appointed by subs. Subs.: S. Kaufman and H. C. Seigal, 72 New Cavendish St., W.1.

Fenners (Surrey) Ltd., Profile Works, 90b Church St., Woking, Surrey. To take over business of manufacturer carried on at Woking by Gerald Fenner Burgoyne, manufacturers of and dealers in mechanical and electrical machines and devices of all kinds, wireless, television and electronic apparatus, etc. Cap.: £1,000. Dir.: G. Fenner Burgoyne.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller

Aliwyre. B716,511. Class 6. Wire of common metal. D.K.B. Electric Ltd., 109 Kingsway, London W.C.2.

Conycote. 717,886. **Conymel.** 717,887. **Conambond.** 717,934. **Conybond.** 717,935. **Conylity.** 717,936. Class 17. Electric insulation materials and insulators. Connollys (Blackley) Ltd., Blackley Vale Mills, Blackley, Manchester 9.

Deafone. B717,214. Class 9. Telephone amplifiers, etc. Televox (London) Ltd., 5 Bourne St., S.W.1.

Electrix. 690,730. Class 9. Electric domestic vacuum cleaners. Electrix Ltd., Sterling Works, Dagenham.

Ferret. 718,096. Class 6. Springs of common metal adapted for use in threading electric cables through conduits. Lewis Spring Co , Ltd., Resilient Works, Queen St., Redditch, Worcs.

Grundig Miss Smith. 717,242. Class 9. Magnetic sound recording apparatus and dictating machines. Grundig (Gt. Britain) Ltd., Kidbrooke Park Rd., S.E.3.

Harrisflex. B715,059. Class 9. Anti-vibration mountings. Howard Clayton-Wright Ltd., Wellesbourne House, Wellesbourne, Warwickshire.

TRADE NOTES

Attached Motors. The Canadian Tariff Board has ruled that separate duty will not have to be paid on electric motors when they are attached to imported machines in such a way that they form with the machine a "single physical unit." The customs authorities will treat attached motors in the same way as they have been treating built-in motors. Electric motors imported as separate entities pay 22½% *ad valorem*. Machines of which they form a part also pay 22½% if they are of types made in Canada. If they are not of such types, they pay only 7½%. Motors imported separately for repair or replacement will have to pay the 22½% duty.

MEETINGS TO NOTE

TUESDAY, AUG. 4

A.S.E.E. (S. London Branch). Two papers on "Contracting." The Hall, Eltham Congregational Church, Court Rd., Eltham, 8 p.m.

WEDNESDAY, AUG. 5

A.S.E.E. (N. London Branch). "Safety Regulations." Mr. Herwald. Queens Head, 677 Green Lanes, Harringay, N.4, 7.45 p.m.

EXHIBITION DIARY

Radio and Television. 20th show at Earls Court opens on Sept. 1 and closes on Sept. 12.

Engineering, Marine and Welding. 19th Show opens at Olympia on Sept. 3 and continues until Sept. 17.

Electro Medical. This exhibition and the first International Congress of Physical Therapy opens at Central Hall, Westminster, on Sept. 7. It closes on Sept. 11.

ENGINEERING AND LIGHTING EQUIPMENT

Mr. S. A. Marples's Statement

THE fourteenth annual general meeting of the Engineering and Lighting Equipment Co., Ltd., was held on July 22, at Winchester House, Old Broad Street, London, E.C. Mr. S. A. Marples, M.I.Mech.E., (chairman of the company), presiding.

The following is an extract from his statement circulated with the report and accounts: I am glad to be able again to submit a satisfactory report on the progress of your company for the year ended March 31, 1953. The results stem largely from improvements in the organisation of the factory to take care of the increasing orders, which we have been fortunate enough to obtain, and reflect credit on the management, staff, and workpeople.

The volume of executed orders due to the defence programme has risen, and it is satisfactory to note that other products of the company, whether classified as general engineering or industrial and street lighting equipment, have shown an increase.

While the turnover and profits constitute a record in the history of your company, I am pleased to state that orders in hand as at March 31 last remain at a high level; in the absence of unforeseen circumstances, this points to a continuance of the prosperity of the company, and we may look forward in confidence to the prospects for the immediate future.

Turning to the accounts you will see that the profit on trading for the year ended March 31, 1953, at £137,700, is £36,318 more than in the previous year. After providing for directors' remuneration, depreciation of fixed assets at the usual rates, and taxation based on the profits for the year, there is a net profit of £41,285, which is £7,669 more than last year.

Your directors recommend that a dividend of 15% be paid on the Ordinary shares for the year ended March 31, 1953.

The total current assets shown in the balance-sheet of £340,956 exceed the total current liabilities of £163,898 by £177,058, representing an improvement of £50,228.

The reports and accounts were adopted.

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Burnley ...	Victoria Mill, Trafalgar Street
Canterbury	33 St. Dunstan's Street
Cardiff	5 Burt Street, Docks
Colchester	152 Brook Street
Dublin	11 Fownes Street
Dundee	1 Whitton Street
Edinburgh ...	15-17 South St. David Street
Exeter	37 Magdalen Road
Glasgow	59-61 Waterloo Street
Hull	21 Chapel Lane
Leeds, 1	1 York Place
Liverpool, 1	29 Hope Street
London ...	51-53 Hatton Garden, E.C.1
Manchester, 3	Austin House, Cumberland St.
Middlesbrough	10 Albert Road
Newcastle-on-Tyne	Pandon Buildings, Manors
Norwich	17 Pottergate
Nottingham	Park House, Friar Lane
Plymouth	4 Richmond Ope, Richmond Street
Sheffield, 1	18 Paradise Square
Southampton	38-39 St. Mary Street

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Antifoam agents for industry and food processing
SILASTOMER silicone rubbers
RELEASIL mould release agents
DRISIL water repellents
Damping fluids
Greases

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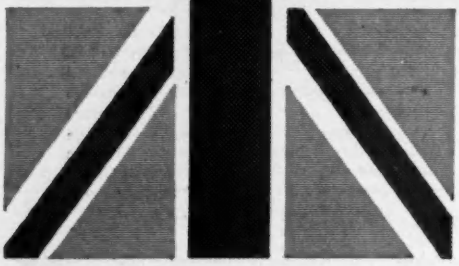

Manufactured by
ALBRIGHT & WILSON LTD.
at their Barry works
for their associated company

MIDLAND SILICONES LTD.
19 UPPER BROOK STREET LONDON W.1
Telephone: Grosvenor 4551

TDW.MS. 13a

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Clyde Sub-Area

APPLICATIONS are invited for the position of FIRST ASSISTANT DISTRICT ENGINEER in the Paisley District. The salary and conditions of service will be in accordance with the N.J.B. Agreement, Schedule "A." Class "E," Grade 4, £803/£934 per annum and is subject to the statutory deductions including superannuation.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or possess an equivalent qualification in electrical engineering and have experience in the construction, operation and maintenance of overhead and underground distribution systems.

The successful candidate will require to reside within reasonable distance of the District Office.

A house could be made available if required.

Forms of applications may be obtained from the undersigned or any other sub-area manager and should be returned to me duly completed with any additional information not later than Tuesday, August 11, 1953.

DANIEL ROSS,
Manager.

208 St. Vincent Street,
Glasgow, C.2. (E 484)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

Doncaster District

APPLICATIONS are invited for the following appointment:

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should preferably be Graduate Members of the Institution of Electrical Engineers and have experience in the construction, operation and maintenance of overhead and underground distribution systems.

Applicants should be prepared to reside in the district and undertake standby duties.

Salary: N.J.B. Class "F," Grade 11, £548/£565 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than August 14, 1953. (E 482)

THE BRITISH IRON & STEEL RESEARCH ASSOCIATION

ELECTRICAL ENGINEER required by the Plant Engineering Division of the above Association for applied research in the iron and steel industry. Candidates should have a degree or similar qualification in electrical engineering, and an interest in heavy electrical engineering and closed loop control of electrical machines.

Starting salary up to £800 p.a. according to age, qualifications and experience. Location of work, London. Post is superannuated under the F.S.S.U. Written applications only to the Personnel Officer, B.I.S.R.A., 11 Park Lane, London W.1. (E 490)

SOUTHERN ELECTRICITY BOARD

JUNIOR ENGINEERS

(Two Vacancies)

NO. 2 (NEWBURY) Sub-Area Office and Oxford District. Salary dependent upon experience and qualifications in accordance with Clause 35 of the N.J.B. Agreement, i.e.:

	Class	Minimum Grade	Maximum Grade
Sub-Area Office	L	20 (£404)	16 (£547)
Oxford	G	16 (£402)	14 (£491)

N.J.B. conditions of service.

Applicants should preferably have experience in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications.

The successful candidate for each appointment will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than August 10, 1953. (E 489)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER

Central Sussex District

SALARY of £740 p.a., rising to £774 p.a., under the N.J.B. Schedule, Class "E," Grade 5. Applicants should be qualified and have experience in the planning, construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. A knowledge of 33 kV practice an advantage. The person appointed must reside in or near Haywards Heath, but living accommodation will be offered to the successful candidate.

Applications, giving two referees, must reach A. Barnes, M.I.E.E., Central Sussex Manager, SEEBoard, Electra House, Church Road, Haywards Heath, Sussex, by August 17, 1953.

A. L. BURNELL,
Secretary.

July 24, 1953. (E 483)

WANDLE VALLEY JOINT SEWERAGE BOARD

ELECTRICIAN/FITTER

ELECTRICIAN/FITTER required for maintenance work at the Board's Disposal Works, Byegrove Road, Merton, S.W.19, at a wage of £8 16s. 0d. per week plus 14s. per week for additional responsibilities. Working conditions will be those of the Joint Negotiating Committee for Local Authorities' Services (Building and Civil Engineering Craftsmen). Applicants should be experienced in power work and be competent to carry out electrical maintenance and repairs on automatic switchgear, starters and motors up to 50 h.p. Subject to satisfactory service, the post will become superannuable after twelve months. Applications should state age, present position and wages, details of apprenticeship and experience, and should be forwarded to the Surveyor to the Board, Town Hall, Mitcham, not later than August 15, 1953. (E 487)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 170/53. ASSISTANT SHIFT CHARGE ENGINEER, Kearsley Generating Station, Stonecliough, near Manchester. Salary £796-£796 (K. 9).

Vacancy No. 171/53. ASSISTANT ENGINEERS (BOILER HOUSE) (2), Ribble Generating Station, Penwortham, Preston. Salary £641-£667 (H.10).

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before August 12, 1953. (E 492)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department. Vacancy No. 22/53

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundation for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with office and administrative buildings.

The salary will be accordance with Grade 5 (£567-£671 per annum) or Grade 6 (£433-£567 per annum) of Schedule "D" of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department. Vacancy No. 44/53

Senior Draughtsmen are required in the Mechanical section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and l.p. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 5 (£567-£671 per annum) and Grade 6 (£433-£567 per annum) of Schedule "D" according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)
Construction Department. Vacancy No. 61/53

Candidates should have experience in the preparation of layouts and diagrams for the installation of e.h.t. and l.t. switchgear, transformers, e.h.t. and l.t. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567-£671 per annum) or Grade 6 (£433-£567 per annum) of Schedule "D" of the National Joint Board Agreement.

SECOND ASSISTANT ENGINEER (CIVIL)
Divisional Headquarters. Vacancy No. 74/53

THIRD ASSISTANT ENGINEER (CIVIL)
North Wilford Extensions. Vacancy No. 75/53

Applicants should hold a degree in Civil Engineering, be Corporate Members of the Institution of Civil Engineers or possess equivalent qualifications.

They should have had experience in the design and construction of heavy foundations, river works, structures in reinforced concrete and steel and other civil engineering works associated with the design and construction of power stations.

Experience in the preparation of specifications, bills of quantities and estimates will be advantage.

The salary for Second Assistant Engineer will be within Schedule "C," Class "AX/DX," Grade 2 (£834-£1,053 per annum) of the National Joint Board Agreement.

The commencing salary for Third Assistant Engineer will be £649-£705 per annum within Schedule "C," Class "AX/DX," Grade 5 (£649-£858 per annum) of the National Joint Board Agreement.

The closing date for these appointments will be August 6, 1953.

THIRD ASSISTANT ENGINEER (MECHANICAL)
Generation Construction Department,
Castle Donington Site. Vacancy No. 77/53

Applicants should have had a fundamental training in mechanical engineering including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern power stations. Candidates should possess a university degree or equivalent qualification in mechanical engineering.

Salary for this appointment will be within Class "AX/DX," Grade 5, Schedule "C" (£649-£858 per annum) of the National Joint Board Agreement.

Closing date for this appointment will be August 6, 1953.

The above appointments will be superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

TEMPORARY CLERK OF WORKS
North Wilford Extensions. Vacancy No. 76/53

Applications are invited from suitably qualified persons for appointment as a temporary Clerk of Works at a wage of £11 per week in connection with extensions to the North Wilford Power Station. The appointment will be for a period of eighteen months to two years.

Candidates must have a sound knowledge of reinforced concrete construction and civil engineering works, and preference will be given to those with previous public works experience.

Closing date for this appointment will be August 7, 1953.

Applications should be submitted on the official form which may be obtained from the Divisional Establish-

(*Continued in next column*)

(*Continued from previous column*)

ments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the Divisional Controller. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(E 485)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the following appointments:—

RESIDENT ENGINEER (MECHANICAL)
Wakefield (New) Power Station.

The appointment will be temporary for the operation of the construction work, the estimated completion date being 1958. The salary will be in accordance with Grade 1, Class "AX" of the N.J.B. Agreement (Schedule "C") or Grade 2, Class "AX," i.e. £834 to £1,103 per annum according to qualifications and experience.

Duties will include co-ordination of main plant contractors and checking of work as erection proceeds, and the supervising and progressing of site construction work.

Corporate Membership of the Institution of Mechanical Engineers or equivalent is desirable.

GENERAL ASSISTANT ENGINEERS
System Operation Department,
Divisional Headquarters, Leeds.

The salary will be in accordance with Grade 8 Class "AX/DX" of the N.J.B. Agreement (Schedule "C"), i.e. £501 to £694 per annum according to qualifications and experience.

Duties will be of a general technical and statistical nature in connection with system operation and control. Applicants should have a good general education and hold technical qualifications at least equivalent to the Higher National Certificate in electrical engineering. Preference will be given to candidates with experience in a generating station.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity Authority, Yorkshire Division, St. Mary's Road, Leeds, 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(E 503)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(A) ASSISTANT ENGINEER ELECTRICAL), Hayle Generating Station. N.J.B. Class "F," Grade 10, £577 to £598. Closing date, August 10, 1953.

(B) FIRST ASSISTANT CONTROL ENGINEER., System Operation Department, Divisional H.Q. Bristol. N.J.B. Class "AX/EX," Grade 5, £649 to £790, £866 to £883. Closing date, August 15, 1953.

Superannuation scheme.

For (a), candidates should have previous experience in electrical maintenance at power stations on h.v. and l.v. switchgear, motors, remote control and relay protective equipment. Technical qualifications should be up to H.N.C. (Elec.) standard, but candidates with O.N.C. (Elec.) will be considered if they have sufficient practical experience.

For (b), duties will cover load despatching and general shift duties in the Bristol Grid Area Control Room. Applicants should be graduates of the I.E.E. or equivalent and have had experience in a steam generating station.

Application forms obtainable from and to be returned to R. C. Barrett, Esq., Divisional Secretary, 26 Oakfield Road, Bristol 8. (E 493)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable post. Salary, inclusive of London allowance, and conditions of service in accordance with the N.J.B. Agreement.

POWER STATION SUPERINTENDENT
Fulham Generating Station

Qualifications: Corporate membership of I.E.E. or I.Mech.E. with sound technical training and wide practical experience in electrical and mechanical engineering and in generating station practice. Candidates must be competent works managers and good organisers, and have had practical experience of negotiating and consultative committees and in the promotion of good labour relations. The officer will be responsible for the general management and operation of the station. Salary, Schedule "A," Class "L," Grade 1, £1,548 per annum. Application may be made on form obtainable from Divisional Secretary, B.E.A. London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (E 488)

NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (TESTING)
Chief Engineer's Department

DUTIES will include testing all types of equipment used on a distribution system, and investigation work. Applicants should be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications.

Salary scale: £834-£1,083 p.a., Grade AX/EX 2. N.J.B. conditions.

GENERAL ASSISTANT ENGINEER
Chief Commercial Officer's Department

To assist in the testing and approval of appliances, and development work on new designs of current consuming apparatus. Applicants should be thoroughly conversant with domestic appliance maintenance and testing, and should preferably possess the Higher National Certificate in Electrical Engineering.

Salary scale: £501-£714 p.a. Grade AX/EX 6. N.J.B. conditions.

Applications to Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester, 8, by August 8, 1953.

THIRD ASSISTANT ENGINEER
(Sub-Area Installation Inspection Engineer), Stalybridge

Applicants should have had extensive experience in electrical installation work, including some years inspecting and testing, in routine meter fixing procedure, and the installation of industrial metering equipments. Preference will be given to candidates who hold a recognised technical qualification.

Salary scale: £719-£734-£750 p.a. Class "K," Grade 10. N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union Street, Oldham, by August 8, 1953.

ENGINEERING DRAUGHTSMAN
Ormskirk

Applicants should preferably have experience in the preparation of plans for new and existing buildings, electrical network diagrams, and the layout and construction of substations. The possession of a Technical Certificate in Electrical or Mechanical Engineering will be an advantage.

Salary scale: £433-£567 p.a., Schedule "D," Grade 6. N.J.B. conditions.

Applications to the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune Street, Preston, by August 8, 1953.

GENERAL ASSISTANT ENGINEER (TESTING)
Barrow

The successful applicant will be required to carry out general testing duties in the testing station at Barrow-in-Furness (Class "A"), and must have had experience in a similar class of station. Preference will be given to applicants holding at least the O.N.C. (or equivalent) in Electrical Engineering.

Salary scale: £552-£573 p.a., Grade J.13. N.J.B. conditions.

CLERICAL ASSISTANT (STORES)
Kendal District.

Applicants should be of School Certificate or equivalent standard, have had considerable experience in stores control and be capable of exercising initiative.

Salary scale: £460-£520 p.a., Grade 2. N.J.C. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by August 8, 1953.

DISTRICT COMMERCIAL ENGINEER
Macclesfield District

Duties will include organisation and control of all commercial staff and functions in the district: supply of information and advice to consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services; organisation and supervision of maintenance work on consumers' premises including emergency service, routine testing and repair of domestic appliances, including control of workshops; control of service centres and exhibitions; supervision of consumer records.

Salary scale: £856-£876-£894 p.a. Grade E. 3. N.J.B. conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Sub-Area Headquarters, Chapel Street, Hazel Grove, Cheshire, and must be returned to him by August 8, 1953. (E 491)

ASSISTANT MECHANICAL ENGINEER required for service at a power station during construction. Applicants should have served a recognised apprenticeship, and have a mechanical engineering qualification. Experience on the construction of mechanical plant outside works would be an advantage.—Applications, stating salary required and giving full details of experience and qualifications, should be addressed to the Secretary, Ewbank and Partners, Ltd., Engineering Consultants, 10-11 Grosvenor Place, London, S.W.1. (E 427)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

BRIGHTON "B" POWER STATION. ASSISTANT ENGINEER (INSTRUMENTS). Applicants should preferably possess Higher National Certificate or similar qualification and must be experienced in the maintenance, testing and calibration of all types of power station instruments. A knowledge of electronics would be an advantage. Class "J," Grade 9, £719 p.a.

BRIGHTON "A" POWER STATION. ASSISTANT ENGINEER (EFFICIENCY). Applicants who should preferably possess Higher National Certificate in Mechanical and/or Electrical Engineering or equivalent qualification must have had extensive experience in the testing and efficient operation of large high pressure generating plant. P.F. experience would be an advantage. Class "H," Grade 7, £772 p.a.

BRIGHTON "A" AND "B" POWER STATIONS. (1) JUNIOR ENGINEER (EFFICIENCY). Applicants who should preferably possess Ordinary National Certificate and have had either a good engineering experience in a manufacturer's works engaged on the manufacture of power station plant or experience in power station operation, will be required to assist in plant investigation, testing and the maintenance of records. Class "L," Grade 20, £429 p.a. (2) ASSISTANT ENGINEER (HANDLING). Applicants, who should possess a knowledge of shipping, coal storage and its associated problems, will be responsible for the operation of the coal and ash handling plant and associated equipment, including mobile equipment. Class "L," Grade 12, £867 p.a.

N.J.B. conditions of service for all positions. Applications, giving details of education, present position, experience, etc., should be received by the Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, not later than August 10, 1953. (E 486)

COUNTY BOROUGH OF DONCASTER

Works Department

AMENDED ADVERTISEMENT

APPLICATIONS are invited for the position of ELECTRICAL ASSISTANT in the above Department at a salary in accordance with Grade A.P.T. VII of the National Scales of Salaries (£710 rising to £785).

Candidates must have had practical experience of domestic and industrial installation work and be capable of preparing estimates and specifications and supervising the carrying out of electrical installations and maintenance work in municipal buildings, works, schools and new housing schemes.

Candidates should also have had experience of street lighting work and will be responsible, under the Borough Surveyor, for works of installation and maintenance of street lighting both electricity and gas.

Education standard should be equivalent to matriculation, and applicants should possess the Higher National Certificate in Electrical Engineering.

Written applications, stating age, education, qualifications and full details of experience, accompanied by copies of two recent testimonials and disclosing in their application whether to their knowledge they are related to any member of, or the holder of any senior office of, the Council, should reach the undersigned not later than Saturday, August 22, 1953.

H. R. WORMALD,
Town Clerk.

Town Clerk's Office,
1 Priory Place, Doncaster.
July 20, 1953. (E 494)

ALLEN WEST AND CO., LTD., require for their Brighton Sales Department, senior SALES ENGINEERS. Must have held similar positions and be conversant all types motor control gear, especially contactor gear.—Applications stating qualifications, experience and salary required to J. H. Hall. (E 504)

BRITISH ELECTRICITY AUTHORITY Headquarters, London, require SENIOR ASSISTANT ENGINEER in the Generation Construction (Co-ordination) Branch. Candidates should preferably be Corporate Members of the I.Mech.E. or I.E.E. Duties entail responsibility for co-ordinating construction work at a group of power stations and include attendance at Site Meetings and visits to power stations. Practical experience in construction of modern power stations including handling of contracts, preparation of commissioning programmes, work on site and co-ordination of projects from inception to commissioning is essential. Salary N.J.B. Grade 1, £1,002 to £1,378 p.a. inclusive. Pension Scheme.—Applications, stating age, present position and salary, qualifications and experience, to D. Moffat, Director of Establishments, Winsley Street, London W.1, by August 17, 1953. Quote reference ET/402. (E 469)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

ALKALINE BATTERIES LTD.,
of Redditch

are the makers of the well-known NIFE nickel cadmium alkaline accumulators, miners' lamps, portable lighting and all kinds of emergency lighting and standby power systems, products which have a wide and growing usage, throughout industry and particularly for export.

THE COMPANY HAS VACANCIES

in its sales engineering departments for

QUALIFIED ELECTRICAL ENGINEERS

for post graduate training, and applications are invited from men who either have a Degree in Electrical Engineering, or are nearing the end of their Degree course, and have completed National Service. Applicants must be prepared to reside in any part of the country, or abroad, and must have a keen interest in the sales development side of an engineering product.

IN ADDITION

to the vacancies for post graduate training, there are a limited number of vacancies for

QUALIFIED ELECTRICAL ENGINEERS

not over 30 years of age, who already have outside sales experience.

The posts are pensionable and progressive, and offer the prospect of executive rank in the company's organisation.

Applications, giving full educational details and experience, if any, should be addressed:—

Commercial Manager,

ALKALINE BATTERIES LTD.,

Union Street, Redditch, Worcs. (E 409p)

BIRLEC, LIMITED, Tyburn Road, Erdington, Birmingham 24, invite applications for position of SALES CORRESPONDENT, primarily for dealing with tenders for heat treatment furnaces. Engineering experience necessary. Education to Degree standard preferred but not essential. Good prospects for young energetic man. —Apply by letter, giving details of experience, to the Personnel Officer. (E 494)

BRITISH ELECTRICITY AUTHORITY (Southern Division) require a GENERATION ENGINEER (CONSTRUCTION) based at Divisional Headquarters, Portsmouth.

Candidates should have had first-hand experience of work involved in the design, layout and construction of new power stations and extensions to existing stations. They should preferably be corporate members of one or more of the recognised engineering institutions. The salary will be within the provisional salary range, £1,325 to £1,800.

Applications, stating age, present position and salary, and giving full details of qualifications and experience, to D. Moffat, Director of Establishments, British Electricity Authority, Winsley Street, London W.1, by August 15, 1953. Quote reference AE/401. (E 495)

CAMEROONS DEVELOPMENT CORPORATION require for service in British Cameroons (Nigeria) an ASSISTANT ELECTRICAL ENGINEER. Candidates should be capable of installing, operating and maintaining power plants as well as local distribution street lighting and house wiring. Qualifications not less than A.M.I.E.E., and it is essential that candidates should have both practical experience and ability to teach native labour. Age limits 25 to 35, although an older man might be considered for the appointment. Commencing salary according to ability and experience in scale £775 to £1,175. Tours 18 to 24 months, with generous leave on full pay. Outfit allowance, £90. Provident fund contributions, 10% employee, 15% Corporation. First-class passages are provided, together with free quarters equipped with heavy furniture.

Applications, in writing, giving full particulars, to Rubber and Mining Agencies Ltd., 52 Leadenhall Street, London E.C.3. Only applications from candidates selected for further consideration will be acknowledged. This post is exempt from the requirements of the Notification of Vacancies Order, 1952. (E 496)

DESIGNER DRAUGHTSMEN for heating and cooking equipment. Electrical knowledge advantageous. Midland area.—State age salary and experience to Box No. 2625, Electrical Times. (E 505)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICAL DRAUGHTSMAN (Male) required for Drawing Office of Carreras Limited. Must be fully experienced. 5-day week.—Full particulars of age, experience and training in writing to Employment Department, Arcadia Works, Hampstead Road, N.W.1 (E 470)

ELECTRICAL ENGINEER required for design and development, F.H.P. Motors for aircraft fuel system accessories. Main qualification Higher National Certificate, electrical engineering. Practical experience of winding and diagnosis of motors desirable. Required to supervise and carry out test work on prototypes, and advise on production problems.—Write stating age, training and salary required to Self-Priming Pump and Engineering Co., Ltd., Trading Estate, Slough, Bucks. (E 433)

ELECTRICAL ENGINEER required to take charge of Overhead Line Contracts in England and Scotland. Experience essential, knowledge of surveying an advantage. Position is permanent, pensionable and offers excellent opportunities for right man.—Applications, giving particulars of age, training, experience and salary required to Employment and Welfare Manager, Johnson and Phillips Ltd., Victoria Works, Charlton, London S.E.7. (E 497)

ELECTRICAL TECHNICIAN required for quality control in manufacture of power cables up to high voltages. National Certificate as minimum qualifications. Knowledge of materials and previous manufacturing experience advantage. Age 22-30. Good salary with prospects. Pension fund, etc.—Write to Staff Officer, British Insulated Callender's Cables, Ltd., Belvedere, Kent. (E 498)

JUNIOR DESIGN ENGINEER required by well-known Company in the Midlands (to assist a senior development engineer). Suitable applicants, who must have completed their National Service, should be familiar with a wide range of heavy electrical plant and have some knowledge of insulation.—Please reply to Box No. 2813, Electrical Times, quoting Ref. D.C.C. (E 471)

LEGG (Industries), LTD., require a SALES ENGINEER to act as sole Representative in the London area. Previous experience is essential in the field covering the application of metal rectifying equipment and medium-size transformers.—Replies, which will be treated in strict confidence, stating age, qualifications and salary required, should be addressed to the Managing Director, Legg (Industries), Ltd., Williamson Street, Wolverhampton, Staffs. (E 466)

MECHANICAL AND ELECTRICAL SALES REPRESENTATIVE wanted for the Leeds area. Age 25/40. To cover sales of Mechanical and Electrical Plant. National Certificates desirable. Commercial aptitude necessary. Progressive position. Superannuation Scheme.—Applications, stating age and salary required, to Box No. 2815, Electrical Times. (E 472)

MECHANICAL DRAUGHTSMAN required for small Site Drawing Office in Kuwait, Persian Gulf. Applicants, not over 35 years of age, should have experience in general power station design and have served a regular mechanical engineering apprenticeship. The starting salary will be £875 per annum, plus a cost-of-living allowance. Married accommodation cannot be promised under 12 months.—Applications, giving full details of experience, should be addressed to the Secretary, Ewbank and Partners, Ltd., Engineering Consultants, 10-11 Grosvenor Place, London, S.W.1. (E 439)

PUBLICITY ENGINEER wanted by makers of power transformers and power capacitors. Bonus and pension schemes in operation. Salary according to qualifications.—Apply: Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. (E 364)

REQUIRED for Order Office, CLERK capable of ordering and dealing with orders for automatic and manual starters and control gear, including Automatic Voltage Regulators, for use with a wide range of a.c. and d.c. motors and generators. Similar experience with control gear manufacturers essential.—Apply in writing, stating present salary, age, experience and whether married or single, etc., to Box No. 2817, Electrical Times. (E 473)

SALES ENGINEER, with electrical and mechanical experience, required by well-known engineering firm, Newcastle-on-Tyne.—Box No. 2769, Electrical Times. (E 292)

SENIOR INSPECTOR with experience of f.h.p. motors and A.I.D. procedure required by Frigidaire.—Apply fully by letter to Personnel, Frigidaire, Stag Lane, N.W.9. (E 506)

TECHNICAL SALES AND CONTRACT ENGINEER required for the preparation of quotations and handling of technical sales and commercial correspondence relating to remote indicating, recording and controlling problems as applied to electrical, gas and water. H.N.C. level or equivalent at least, as well as some experience in similar position required.—Apply, by post, with full particulars to General Manager, Measurement Ltd., 7 Fitzalan Street, Kennington, London S.E.11. (E 507)

THERMODARE (GREAT BRITAIN) require AGENTS for 'Off Peak' Storage Heating in the following areas—North East, Midlands, South Wales. Must have heating experience.—Reply, 36 Victoria Street, London S.W.1. (E 474)

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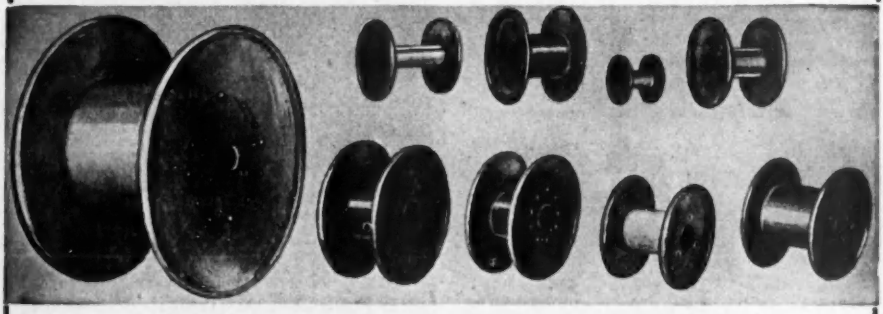

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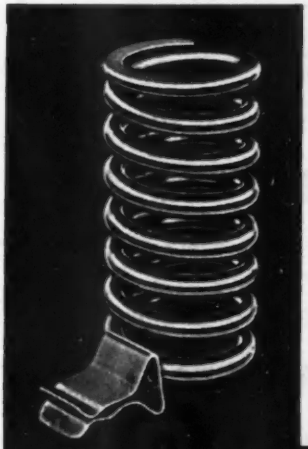

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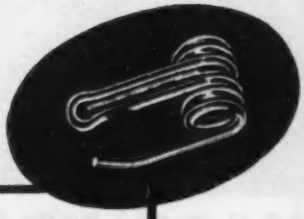

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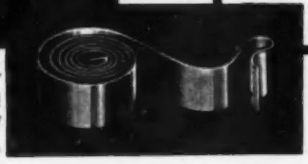

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INDEX TO ADVERTISERS

Aerialite, Ltd. 11
Aluminium Wire & Cable Co., Ltd. 3
Ashdowns, Ltd. 28
Attwater & Sons 68

Babcock & Wilcox, Ltd. ... 1
Bayliss Jones & Bayliss, Ltd. ... 35
Bridges, F. W., & Sons, Ltd. ... 56
British Die Casting & Engineering Co., Ltd. 57
British Insulated Callender's Cables, Ltd. 23
British Thomson-Houston Co., Ltd. 78
Brook Motors, Ltd. 26
Brush Electrical Engineering Co., Ltd. 30
Burco, Ltd. 70

Cable Makers Association ... 33
Cayson Electrics, Ltd. 38
Channel Conduits, Ltd. ... 4
Chloride Batteries, Ltd. ... 65
Coleman, T. B., & Sons, Ltd. ... 6
Cox Walkers, Ltd. 70
Crabtree, J. A., & Co., Ltd. ... 25
Cressall Manufacturing Co., Ltd. 4
Crompton Parkinson, Ltd. ... 75

Dorman & Smith, Ltd. 67
Downes & Davies Ltd. 53

East London Mica Works ... 58
Edison Swan Electric Co., Ltd.... 24
Electric Construction Co., Ltd. 2
Electrical Times 74
Engel & Gibbs, Ltd. 14
Engineering Marine Exhibition 56
English Electric Co., Ltd. 7, 55
Evershed & Vignoles, Ltd. ... 76

Ferranti, Ltd. 20
Foilsain-Wycliffe Foundries, Ltd. 60
Foster Transformers, Ltd. ... 16

General Electric Co., Ltd. 42, 44
Gillott Electro Steam Cookers, Ltd. 66
Grelco, Ltd. 72

Hague & McKenzie, Ltd. ... 6
Harboro Rubber Co., Ltd. ... 6
Heatrae, Ltd. 61
Henley's W.T. Telegraph Works, Co., Ltd. 45
Heyes & Co., Ltd. 60
Higgs Motors, Ltd. 10

Johnson & Phillips, Ltd.... 27, 73

Lancashire Dynamo Switchgear, Ltd. 29
Lawson Bros. 53
Lister, R. A., & Co., Ltd. ... 28
London Electric Wire Co. and Smiths, Ltd. 18
Low, Duncan, Ltd. 38

Martindale Electric Co., Ltd. ... 54
Metropolitan-Vickers Electrical Co , Ltd. 9
Metway Electrical Industries, Ltd. 56
Midland Electric Manufacturing Co., Ltd. 31
Midland Silicones, Ltd. 46

Nalder Bros. & Thompson, Ltd. 63
New Switchgear Construction Co., Ltd. 14
Newton Bros. (Derby) Ltd. ... 62

Parmiter, Hope & Sugden, Ltd. 77
Partridge, Jones & John Paton, Ltd. 17
Partridge, Wilson & Co., Ltd. ... 40
P. & B. Engineering Co., Ltd. ... 66
Permali, Ltd. 69
Process Control Gear, Ltd. ... 72

Radiovisor Parent, Ltd. ... 72
Rainsford & Lynes, Ltd. ... 64
Reels Ltd. 52
Resistances, Ltd. 74
Reyrolle, A., & Co., Ltd. ... 36
Rowlands Electrical Accessories, Ltd. 12

Salter, Geo., & Co., Ltd. ... 15
Sanders, William, & Co. (Wednesbury) Ltd. 4
Saxonia Electrical Wire Co., Ltd. 72
Scottish Cables, Ltd. 41
Siemens Electric Lamps & Supplies, Ltd. 71
Sifam Electrical Co., Ltd. ... 38
Simon-Carves, Ltd. 8
Smart & Brown (Engineers), Ltd. 64
Standard Telephones & Cables, Ltd. 37
Sterling Varnish Co., Ltd. ... 13
Sunvic Controls, Ltd. 19

Taylor, Tunnicliff & Co., Ltd. ... 32
Thorpe, F. W., Ltd. 74
T.M.C.-Harwell (Sales), Ltd 59
Tok Electrical & Industrial Mechanisms, Ltd. 68
Transformers (Watford), Ltd. ... 21

Volex Electrical Products, Ltd. 22
Vulcanised Fibre, Ltd. 5

Walsall Conduits, Ltd. 34
Washers, Ltd. 74
Westinghouse Brake & Signal Co., Ltd. 39
Wilkinsons Tools, Ltd. 58
Wootton & Co., Ltd. 62

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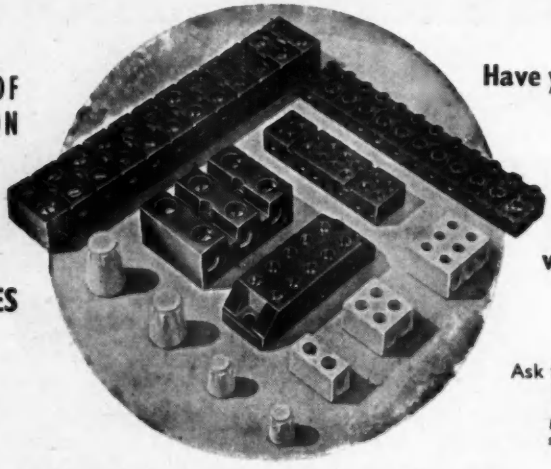

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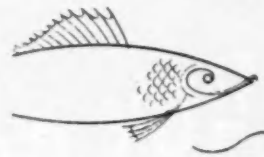

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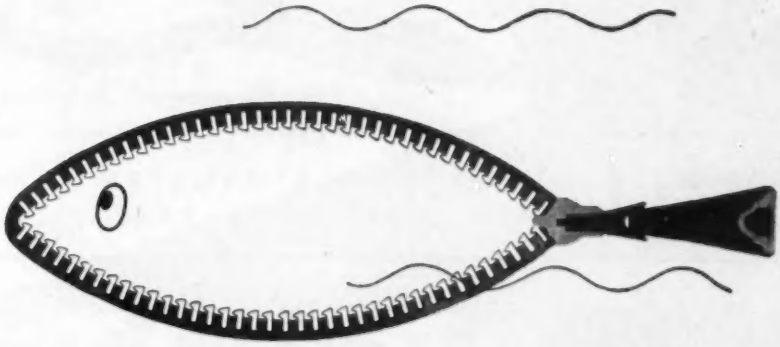

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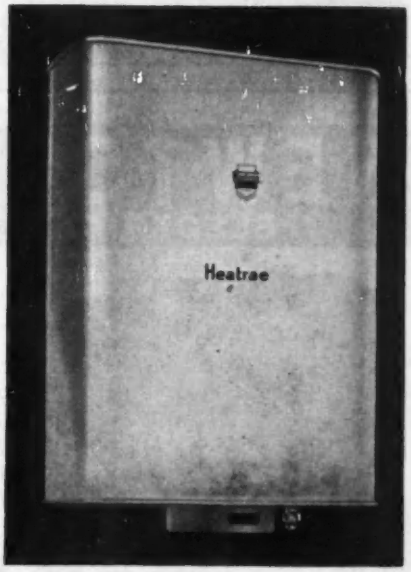

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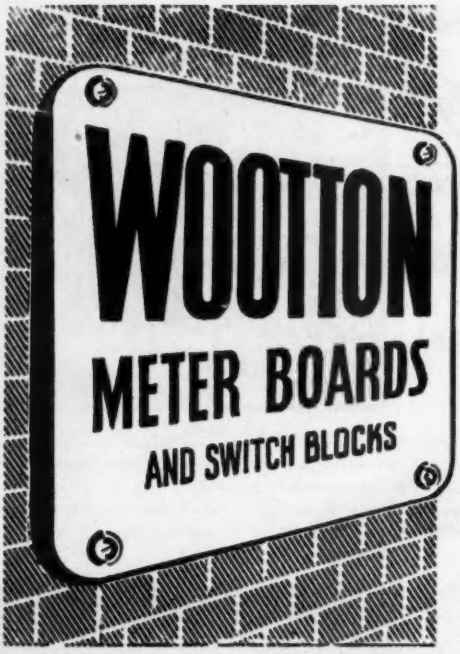

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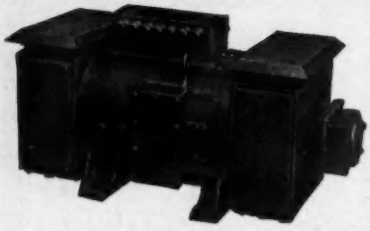

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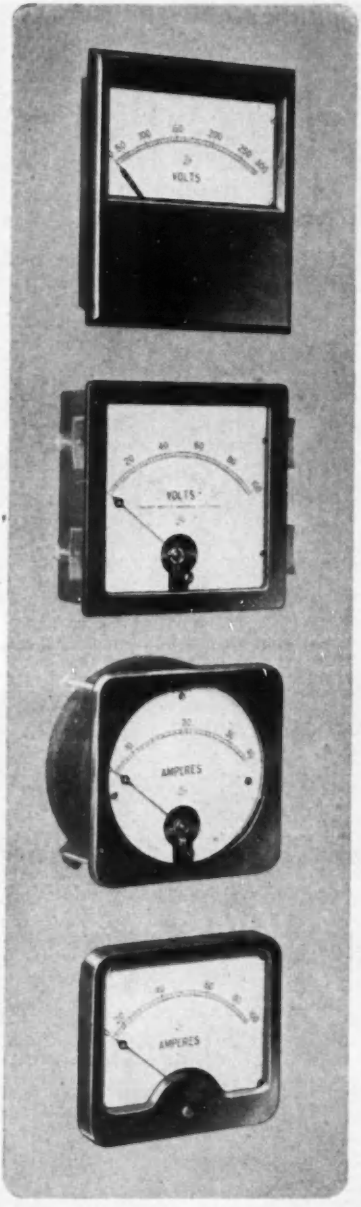

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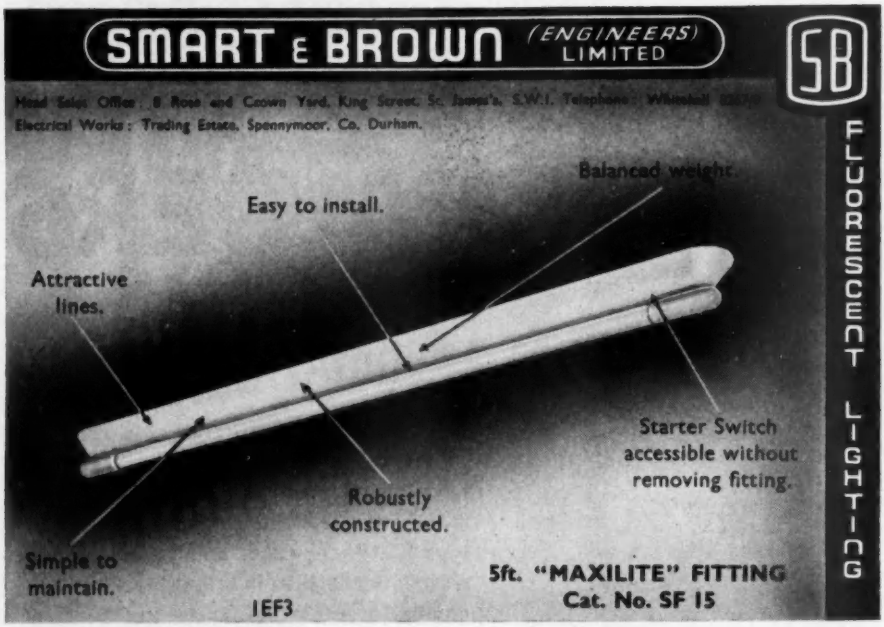
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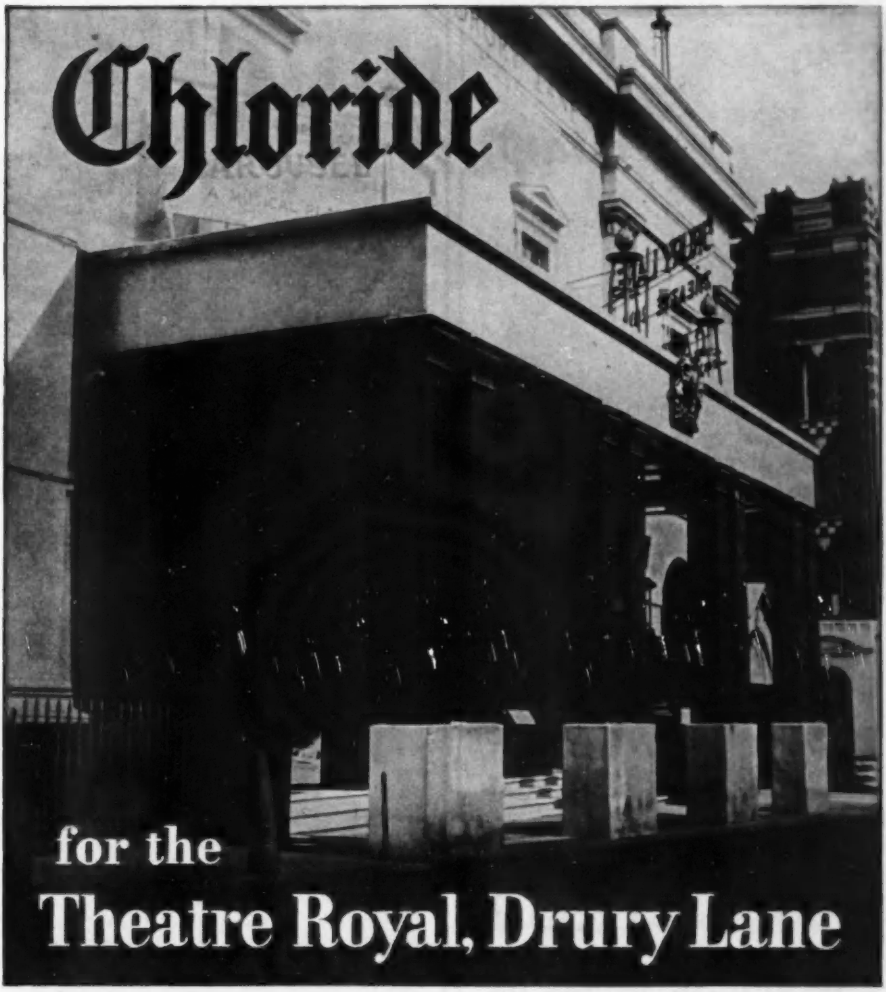

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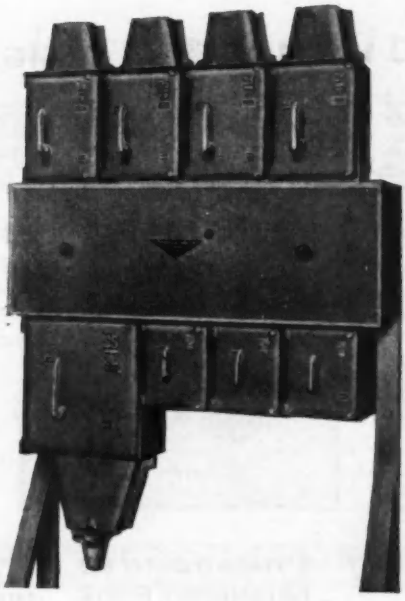

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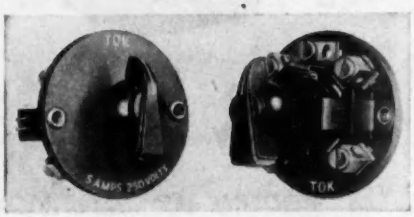

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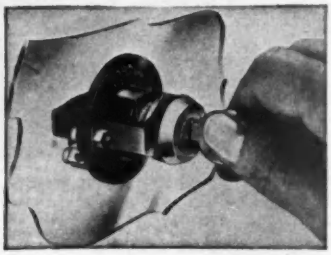

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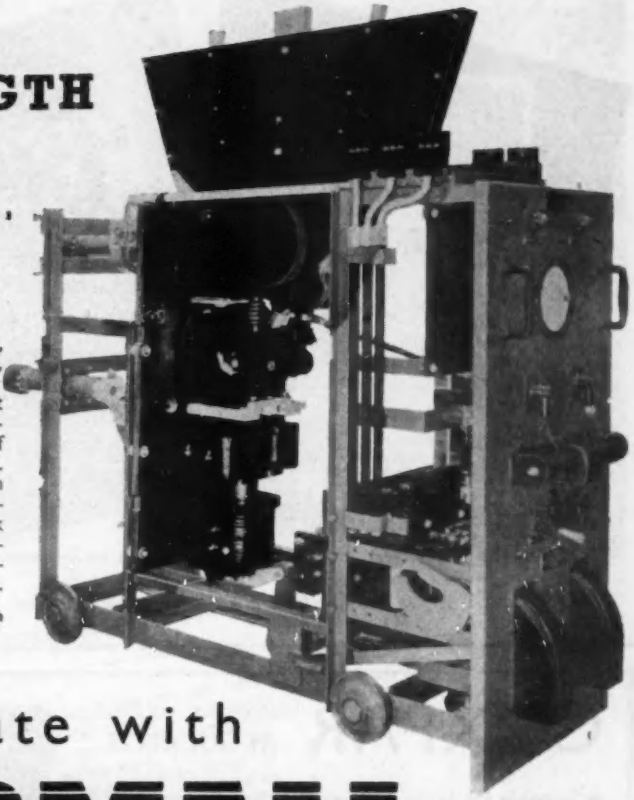

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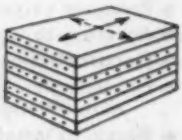

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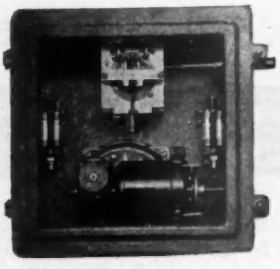

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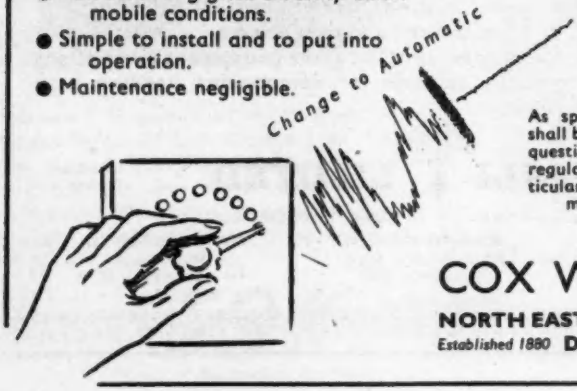

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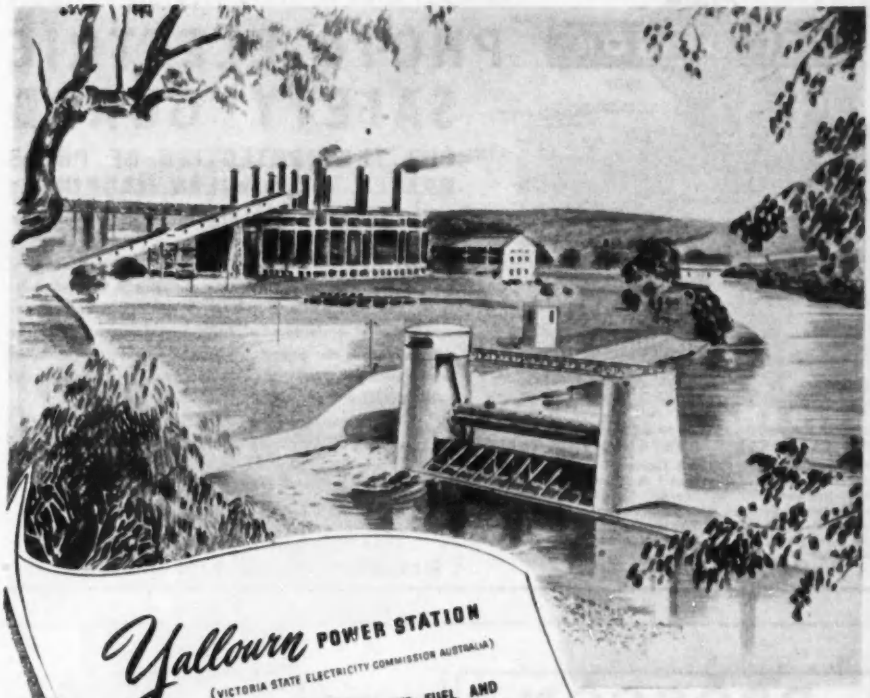

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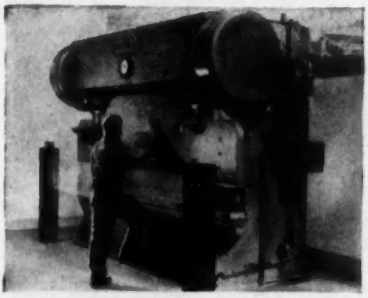

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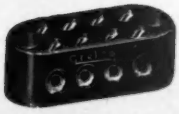

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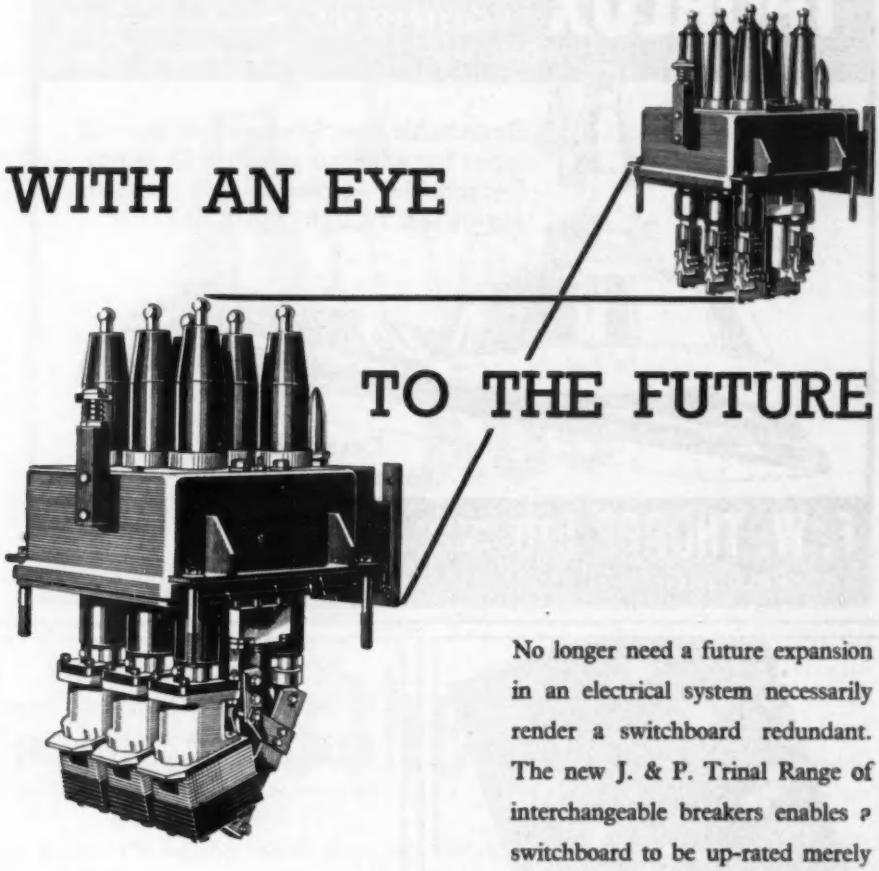

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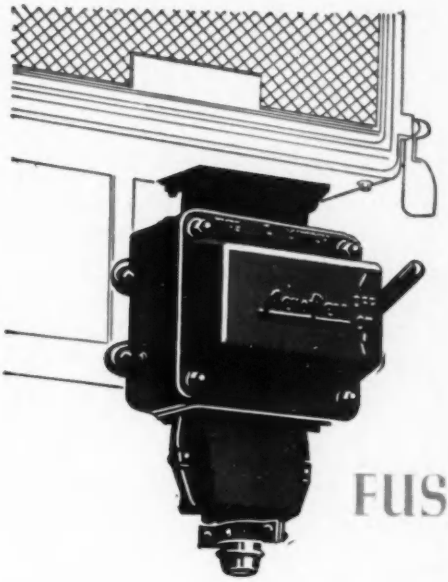

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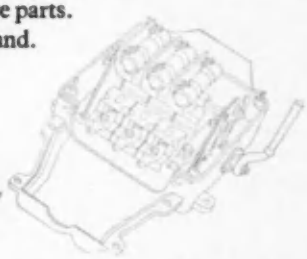

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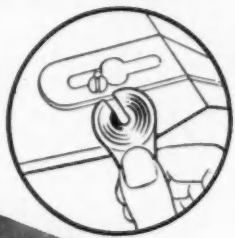

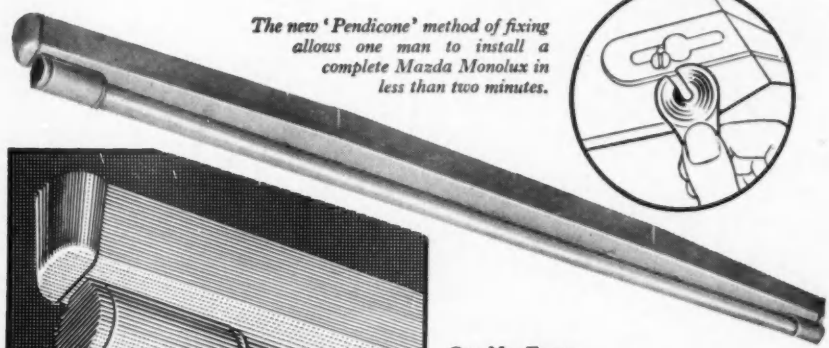

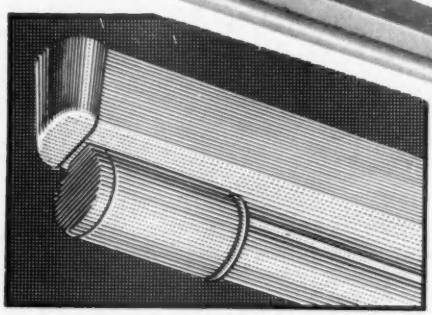

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